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AVIATION

The Oldest American Aeronautical Magazine

MAPPING *13,000 Sq. Mi.* OF *Alaska*

A REVIEW AND ANALYSIS OF THE *European Tour*

THE *Dornier Do. X*

IN TWO SECTIONS
Section One

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tions point to the fact that the Uni...
States is fast forging to the front ...
the development of commercial avia-
tion."

Dust Raised by Planes Annoys Westchester

County Threatens to Close [redacted] Airfield Unless It Stops

Special to the Herald Tribune

WHITE PLAINS N Y, Aug 21—With the filing of two more complaints against the dust raised by airplanes on [redacted] Airfield, at [redacted] District Attorney of Westchester County threatened today to close the field unless steps were taken to abate the dust nuisance.

Residents of the vicinity of the field ... protested for the last several weeks ... propellers of planes on the field ... clouds of dust which were consid... annoying in summer when windows are ...

[redacted] and ... [redacted] who live across the state road from [redacted] Airfield complained today to [redacted] Chief Assistant District Attorney, and said that the situation has continued for more than a year despite repeated conferences with the field officials.

[redacted] conferred later with [redacted] who said he would wait several days and that if the field were not ... other steps ta... keep ... dust he wo... close the ... started ... [redacted] three ...

—*New York Herald Tribune, August 23, 1929.*

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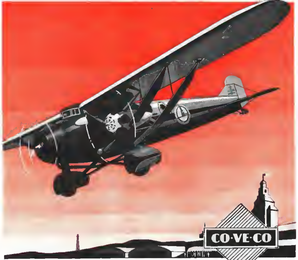

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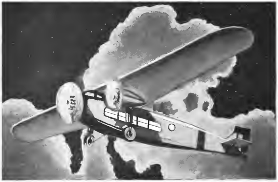

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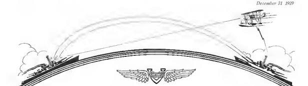

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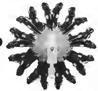

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Volume 27 . . . ***December 21, 1929*** . . . Number 25.

Diversifying Terminal Facilities

NEW YORK CITY has two railroad stations within the boundaries of Manhattan, and several others barely across the Hudson River. There are few travelers resident in the eastern part of this country whose experience has not included an occasional flurried dash by taxicab in the anxious endeavor to make a connection when arrival at the Grand Central has preceded by but twenty minutes or so the necessary hour of departure from the Pennsylvania, or vice versa. There are few dwellers in the neighborhood of Albany who have not given way to occasional exasperation at the impossibility of securing a through car to the south or of checking baggage to any point beyond New York without arranging,—and paying,—for a transfer through the city.

Other metropolitan centers, finding themselves in glass houses, have no privilege of casting stones. Detroit, Chicago, Baltimore and Montreal have the same multiplicity of rail terminals. London, with close to a dozen major stations, presents a complexity even worse than any American city. With so distressing an object lesson before them, the operators of air transport lines might have been expected as a matter of course to pick a common terminal in each city, where passengers, baggage, and mail could be trans-shipped without waste of time and without inconvenience. The facts do not fit the expectation.

Los Angeles, with eight air lines under seven independent managements, already has them flying out of five different fields. Other busy western centers show a tendency in the same direction. Some cities not so busy still split up their terminal facilities to a ridiculous degree.

There is one community of very modest size through which two air lines pass, each one running a single plane in each direction daily. There is at least a theoretical opportunity of transfer from one to the other. If it remains theoretical it is partly because the companies concerned have selected to use separate fields a couple of miles apart.

We cannot too generously applaud the financial courage that has provided the funds for such a multitude of transport fields of such noble dimensions and splendid quality, and we heartily appreciate the thought that has gone into their planning and, in many instances, the exceptional artistic value of the appurtenant buildings. Nevertheless we view this extreme separatism with some little alarm and a great deal of regret, for at least three reasons.

In the first place, it is a drain upon air transport's financial resources. The transport companies themselves obviously ought to be the best judges of what they can afford, and in some cases the field overhead is carried by other operations than those of straight transportation, but the building of magnificent passenger terminals, any one of which would be capable of handling several times the aggregate traffic in sight for some time to come, is inherently wasteful. There has to be a corresponding increase of income somewhere along the line. The total load that the public has to be persuaded to carry in order that air transport may be a financial success is proportionately increased.

Of more direct importance to the traveler is his own convenience. With the further development of the transport map, and the filling out of schedules with more frequent departures, the competition between air lines will appear unimportant compared with their cooperation. Interline tickets will be a commonplace. Every company will benefit by simplifying the process of transfer and minimizing the loss of time involved in accomplishing it.

Finally there is a problem of control, which will be a major one. While collision hazards might be enhanced by doing all flying to and from a single point if the pilots flew perfectly blind, they will be much reduced by being kept under a wholly unified radio control.

When conditions are bad, all the aircraft converging on a city should be immediately under the command of a single official, with all the communications at his finger-tips. There is no other way of safety. If radio beacon circuits have to be maintained on several parallel courses between the same cities leading to fields only a few miles apart, confusion will become intolerable.

We do not deny that there are communities in which the local circumstances are so peculiar that the regular use of several terminals, as opposed to the mere emergency use of secondary fields when the regular one is covered with fog, may be desirable, but we believe that such cities are few. We believe that concentration is definitely in the general interest in nineteen cases out of twenty. We speak for the passengers of the future and for air transport progress in expressing the hope that during the next few years, at least, every possibility of agreement will be exhausted before more individual companies strike out on independent lines and without regard to their neighbors.

Seaplane Research

AMERICA is awake to the seaplane at last. After years in which the voices of a few prophets crying in the wilderness echoed unnoticed,—years when even the Navy seemed content to allow the art of flying boat operation to perish along with the last F5L, and confined new design and construction to the annual production of one or two new PNs at the Naval Aircraft Factory,—flying boat factories suddenly spring up on every hand. Not able to wait for the evolution of American designs in addition to the very few that have already proved themselves, promoters and financiers have combed Europe for promising types. Already we have drawn on the products of Germany, France, Italy, and Great Britain, all of them either actually being built in the United States or planned for construction here in the near future.

All that is a commonplace. It may seem too old a story to be worth repeating editorially, but it is easy to take it too much for granted. Assuming that we have a flying-boat industry, and that it is here to stay, what next? How shall we guide its growth? We cannot resign ourselves to remain permanently patient followers in the footsteps of Dornier and Rohrbach, of Schreck and Short. We cannot rely permanently upon the constraining of commercial design to close parallelism with the more or less standard hull form adopted by the Navy, excellent as is its record and great as is the credit that it sheds upon Captain Richardson and his co-workers in its evolution. We should restrict our progress in a sorry measure if we denied to the purely commercial builder, having no direct relations with the naval service and seeking none, the opportunity of developing his own originality and displaying his own talents under the most favorable conditions.

Certainly it is impossible, especially since the focussing of so much attention upon the giant seaplane, to depend on trial and error, or to hazard the whole fate of the sum invested in building a new type upon the efficiency and seaworthiness of a novel form of hull based purely upon speculation.

To the fundamental question, as to many others of the same type, there is only one answer. Research holds the key,—and research upon seaplanes means the towing basin, or water channel. In it we find the aquatic parallel for the wind tunnel. By its use we are in position to determine quickly and cheaply and safely and accurately the peculiarities of behavior of a hull upon the water, landing or taking off. We can evolve at least empirical, if not rational, laws of designing for specified characteristics of action on the surface.

For nearly twenty years seaplane hull studies have gone on in Washington, handicapped by the limited speed of movement possible in the Navy Yard basin and by the inadequacy of instruments designed for a much heavier class of work, handicapped by pressure upon the capacity of equipment and staff and by the necessity of competing for a place on the schedule with studies of battleships and destroyers. Now, for the first time in this country, there is to be a laboratory having seaplane research as its first aim.

The aircraft industry does not yet seem to appreciate what cause for rejoicing there is in that fact. Those who see a great future for the seaplane and recognize the need of constant technical progress in the design of the type should fix an eagerly impatient attention on the National Advisory Committee for Aeronautics. They will still have some time to wait, but progress is being made. The day when the Committee opens the new high-speed water channel at Langley Field, making it available for research and for the testing of the industry's own products, will exceed in potential importance,—we say it soberly and conservatively,—any other in American seaplane history in the last ten years.

Salesmen Not Pilots

IT IS AN AXIOM of selling that nothing can equal face-to-face personal contact. Barring certain types of mail order business, almost all selling is done by word of mouth between two individuals, and much as direct mail and other forms of advertising may help, it is the personal appeal that wins names on the dotted line.

Aircraft selling is no exception to this rule and the need for more and better aircraft salesmen has been and is being felt. There has been much contention as to whether or not aircraft salesmen should first be pilots, the chief argument in favor of pilot salesmen being that only a pilot can speak the language of the air. On the other hand it must be admitted that most pilot-salesmen are pilots first and salesmen second. And in these days of increasing sales competition a salesman should be able to concentrate all his time on selling only.

It must be admitted that aviation as an industry did not advance greatly until big business stepped in, and it seems now that sales organizations might profit by an infusion of fresh blood. After all, in selling aircraft and their services it is more important to talk to business men in their own language, that of dollars and cents, than to color the conversation with aeronautical terms. More and more we must train young men for aircraft and aviation sales work, not by putting them through flying schools and ground schools, but by organizing aviation business schools which will make it possible for these salesmen to intelligently discuss the economics of using the air as a medium of travel and commercial transportation.

Talking Safety

THE AIRCRAFT INDUSTRY'S problem is one of persuasion. Neither the manufacturers of aircraft nor the operators of air lines can remain content with their present patronage. Before we can consider that a sound footing has been established we shall have to multiply our potential clientele several times over.

There are today many thousands of people who do not travel by air, notwithstanding the possession of ample means and ample motive. They are in a financial position not only to travel upon the air lines, but in many cases even to buy planes of their own. Their time is valuable, and they spend much of it upon the road. Still they stay out of the air. Why? That is the question which we must answer.

There may be many partial answers, but the factor which certainly plays the leading part in an enormous number of cases is fear. Some millions of Americans are still afraid to make regular use of the airplane as an ordinary vehicle of transport, and we shall do ourselves not a particle of good by blinking that fact or seeking to dismiss it from consideration by saying that all those so affected are fools or cowards, or that their state of mind is to be blamed on the newspapers or on some other third party. The attitude of those who ought to use aviation but do not is a fact. As such we must recognize it. As such we must vigorously contend with it.

The imputation of cowardice to those who, because of lack of accurate information, or for any other reason, do not agree with us that the airplane is safe enough for ordinary employment without thought of hazard will get us nowhere. Those who do not feel disposed to patronize the air line cannot be shamed or brow beaten to doing so. Every intelligent man draws somewhere the line between what he considers justifiable and unjustifiable risks. Each of us will do certain things in a dire emergency that we would not consider proper as a matter of daily routine. We differ among ourselves only in the point at which our lines are drawn. What we have to do on behalf of aviation is to persuade, by precept and example, by sober argument and by emotional appeal, the great body of our fellow citizens that their individual lines bounding the activities which they consider proper for themselves should be drawn to include aviation.

We do violence to what many enthusiasts have reverenced as a basic article of their creed that safety should never be mentioned. They feel that it should be taken for granted, and that we should treat the prospective passengers as though no tremors on that score could ever enter their minds. Despite our respect for the eminence and experience of those who hold that view, we are quite sure that they are entirely wrong. We cannot suppress this question by evading it. It seems to us rather that, if all discussion of safety be refused, the general non-aeronautical public will derive the impression that we have an inferiority complex on the subject and that the aeronautical people do not dare to talk of their safety record at length and in detail because they are ashamed of it. We do not for a moment admit that any such suspicion is justified, but the suspicion should be given no opportunity of arising.

It would seem to be a rather sensible idea if we refrained from taking so much stock in the much used phrase that the general public is airminded. It is far from that, and it will take much educational work on the part of the entire American aeronautic industry before that pleasant and profitable state will be attained. There are two kinds of flying, safe and unsafe. At present the man in the street can not tell the difference, and therefore regards all flying activity with skepticism. To educate him, and the members of his family, as to what safe flying is, and to its everyday value is the major portion of our task.

This subject is too large to be covered in a single editorial. We shall return to it in some form and in its various details again and again, for we are convinced that it is vitally important. We believe that the safety of flying under proper conditions should be argued frankly. We believe that safety should be a central feature in aeronautical advertising and publicity, and that the facts should be plainly recited. Some of the propaganda which has gone out in the past has been so crude and obviously misleading as to insult the intelligence of an intelligent reader. To distribute that sort of stuff is worse than to shun and evade the issue altogether, but there is a middle ground of intelligent and fearless discussion that is far better than either.

Tail SPINS

By Captain Harry A. Sutton
U. S. Navy

Figures A, B, C and D show progress of drop tests conducted at the N.A.C.A. laboratories on the above model

THE PROBLEM of designing an airplane which will be efficient in normal operation and safe under the abnormal condition of a tail spin has rapidly increased in importance within the last year during which a great many new airplane designs have been produced. Engineering has been rushed in order to permit early production of new models, with the result that, in many instances, serious difficulty has been encountered in meeting safety requirements. Sufficient information on airplane spinning has been published to enable a good designer to produce an airplane having satisfactory spinning characteristics *if this is the primary object*. The problem becomes more complicated when the aim is to produce an airplane which will be more efficient than existing passenger or mail carrying airplanes and which will recover from tail spins satisfactorily, because compromises must be made in the design and their effect cannot always be predicted without extensive engineering investigation and experiment.

Studies made over a period of several years have demonstrated that there are several important factors which must be considered, principally, the effects of general control characteristics of the airplane, the longitudinal position of its center of gravity, its mass distribution, the variation of its lift characteristics near the angle of maximum lift, and stagger or sweepback in a biplane. It was concluded at one time that monoplanes were not so susceptible to spinning difficulties as biplanes because of the absence of mutual interference effects between the wings of a cellule; however this has proved incorrect in several instances. There are undoubtedly differences between monoplanes and biplanes in their aerodynamic reactions during a spin, but these differences are not necessarily controlling factors in determining the character of tail spins. Additional factors of generally lesser importance are gyroscopic torque, vertical position of center of gravity, engine operation, vertical fin surface distribution, shape and relative position of vertical and horizontal tail surfaces.

The subject of spinning characteristics of both military and commercial airplanes is of enormous interest at the present time. The analysis of those abnormal spins from which recovery is difficult or impossible is particularly important. It is, therefore, with special gratification that we present this article and the one immediately following, giving two different points of view, both based upon long practical experience in spinning tests and also in the derivation and application of theories bearing upon the subject. Captain Harry A. Sutton, lately of the Material Division of the Air Corps, now of the technical staff of the Aviation Corporation, will be recalled as having received the Distinguished Flying Cross, and also the MacKay Trophy for the most notable achievement of the year by a military aviator, for his work upon a military observation airplane which had shown dangerous spinning characteristics. He directed the experiments and made the test flights himself.

Fig. A

Fig. B

RESEARCH which will produce results generally applicable to all cases is made difficult by the numerous factors of wide differing character which must be investigated, each through a considerable range of possible influences, separately and in combination with the others. The actual motions of an airplane spin are not steady in a mathematical sense and are practically impossible to duplicate in a wind tunnel. By placing certain restrictions on the motion of a model, valuable information on autorotation has been secured in wind tunnel tests; however these restrictions may be the cause of drawing erroneous conclusions. Any turbulent condition of air flow in model testing has always caused difficulty in applying the results to full scale performance and autorotation tests magnify this inaccuracy since the airflow must be very turbulent near a rotating model in a tunnel. Dropping tests, in which models were released with an initial spin and allowed to fall freely for a considerable distance, produced some information of value, but the conditions of such tests are hard to control. It is difficult to provide sufficient height of free fall in undisturbed air and to prevent damage to, or change in alignment of the model. The effects of mass distribution are very difficult to simulate in model testing, while the effects of gyroscopic torque and propeller slipstream are practically impossible to duplicate in small scale. Model testing my means of a wind tunnel can be particularly valuable in determining relative efficiencies of various sizes and shapes of control surfaces, and in developing an efficient airfoil which will have less tendency to autorotate than those now generally used.

The best design criteria now available for use in producing an airplane having safe spinning qualities were developed from study of full scale spins made on numerous airplanes of different types combined with the application of previously known principles of aerodynamics and mechanics. In the further development of basic principles it is highly important that as much as possible of the experience gained in full scale spinning be made available for general study. Actual determination of the motions of spinning in full scale is exceedingly difficult; however, the continuous measurement of accelerations and pressure distributions at various points on the airplane during a spin is practicable and would provide valuable information. Tests of this nature are generally beyond the scope of commercial organizations and governmental research agencies must be relied upon for such investigations. The series of tests now in progress under direction of the N.A.C.A. should produce much information of practical value.

The lift of an airfoil varies in a fairly uniform manner with increase in angle of attack until near the angle of maximum lift, where the rate of increase in lift begins to drop off until the maximum is reached, where a small increase in angle of attack causes a considerable reduction in lift resulting from a change in air flow conditions about the wing. This is a fundamental characteristic of all airfoils. In a normal straight stall in which the airplane does not turn or bank, the result is a gradual settling or a whip stall, depending on the elevator control available and the manner in which it is used. All pilots are familiar with this phenomenon. If the airplane is allowed to the turn or roll while in a stalled attitude, the resulting motion causes a change in angle of attack and lift distribution along the wing span. The angle of attack is increased beyond the stalling angle on the downward moving wing and is decreased on the upward moving wing. This causes a decrease in lift on the low wing and a relative increase on the high wing which tends to increase the initial roll. The decrease in lift beyond the

stall on the downward moving wing is accompanied by an increase in drag which tends to turn the airplane in the direction of the roll. The effects of a turn while the airplane is stalled are similar, and so long as the airplane is held in a stalled attitude any initial roll or turn increases automatically resulting in a spin. Most pilots are familiar with these characteristics and have found by experiment the difficulty of stopping a roll or turn which has been started during a stall without regaining flying speed by decreasing the angle of attack. Most of them have also found that a spin is relatively esay to top during its initial stages. As the spin gathers momentum, other factors, such as inertia forces, gyroscopic effects, etc., enter in to make recovery more difficult. These depend largely on the speed of rotation and the problem of recovery from spins can be considered as one of providing some means for stopping the rotation or of reducing the effective angle of attack to a point below the stall.

Considering in detail the various factors which determine the manner in which an airplane spins and its ease of recovery from a spin, it is essential that the controls be effective and easy to operate. Aileron control is the least important of the three controls after a spin has started, but poorly designed aileron controls are often responsible for inadvertant spins. This is due to yawing moments caused by their operation in maintaining lateral level, especially at low speed and high angle of attack. If a wing starts dropping at slow air speed and the ailerons are used to bring it up, the drag of the downward moving aileron should be balanced by that of the upward moving aileron on the opposite wing so there will be no tendency for the airplane to turn. In many cases, the downward moving aileron exerts much greater drag than the one which moves up and the airplane tends to turn in the direction of the low wing. The use of rudder to prevent this often results in a skid which completely stalls the airplane and a spin results. Thus adverse yawing moment due to ailerons can be eliminated by any one of several well known methods, one of which is by use of differential aileron motion where the upward moving aileron moves through a greater angle than the one which is moving down. In general, the aileron is the first of the controls to lose effectiveness during a stall, and in a spin they are of small aid. Movement of the ailerons from one extreme to the other during a spin will often have a noticeable effect on the angle of bank and will give the pilot a momentary disagreeable sensation while the change is taking place, but their effect in stopping rotation is very small. If they were capable of exerting a large drag force at the wing tip some benefit would be secured, however this is contrary to the characteristics desired in aileron controls for normal flying operations.

THE ELEVATOR and rudder controls are relied upon almost exclusively in recovery from spins and are generally used in combination, although in some cases it may be possible to stop a spin by use of either the rudder or elevator alone without regard to the position of the other control. The principal effect of the elevator is in controlling the attitude or angle of attack of the airplane. In starting a tail spin it is pulled up to stall the airplane and held there to keep it stalled. If the airplane is allowed to turn while thus completely stalled, either by use of the rudder or because of dropping a wing, the usual result will be a spin. A spin can often be started by use of the elevator alone with the rudder free or held in neutral position, while it is practically impossible to start a spin by use of the rudder alone if the elevator is left free or held in neutral. After the airplane has started spinning, the rotation sets up autorotative forces on the wings and, usually, inertia forces which tend to maintain a stalled attitude, and the spin will often continue if the elevator is released. The safe spin is one in which it is necessary to hold the elevator up to maintain the spin since in this case the airplane possesses an inherent tendency to dive out of the spin and will do so if the controls are released. As the spin continues, if the elevator load is reversed and pressure is necessary to prevent the stick from coming back, the airplane will not stop spinning if the controls are freed and it may be necessary to exert considerable pressure on the stick to change the attitude sufficiently to stop the spin. In such cases the airplane will generally spin at a progressively flatter attitude if the elevator is left free until the force needed to decrease the angle of attack sufficiently to stop the spin may exceed that capable of being exerted by the elevator. Dependence must then be placed on the rudder to stop or slow up the rotation. The rudder is usually less effective in stopping a spin than the elevator. Stalling is the primary cause of spinning and this is controlled by the elevator while the rudder exerts its effect in recovery from a spin in a secondary manner through slowing up or stopping the rotation, after which recovery from the stall must be effected by the diving tendency of the airplane or by use of the elevator. It is to be expected in the normal case that the elevator would be more effective than the rudder in a spin. Both are generally used in starting a spin and in the recovery.


Fig. C

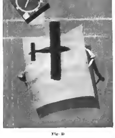


Fig. D

As the attitude of the airplane and its speed of rotation change during a spin the airflow conditions at the tail surfaces are modified and the effectiveness of the elevator and rudder may be greatly reduced. Tail surfaces are designed to be more effective under normal conditions when the air stream strikes them from the front at relatively small angles. In a spin the attitude of the airplane and its motions of rotation combine to greatly change the direction from which the air stream strikes the tail surfaces, so that it should not be surprising to find that in some spins a particular control which is normally sufficiently effective is almost totally lacking in effect. Usually only one of the tail controls is affected in this manner and in most instances the elevator retains effectiveness although the loads on it may be very high. No satisfactory design criterion exists for avoiding this condition since no exact data is available regarding its cause. It would seem best, however, to avoid rectangular stabilizers of large chord and rudders of small height above the stabilizer especially if they are entirely behind the stabilizer. Fig. 1 illustrates possible blanketing effects. This is probably the reason that in some cases there is practically no air pressure on the rudder during a spin.

THE ANGULAR MOTION of elevators should be properly proportioned so that the upward motion permitted is only slightly greater than the downward motion. Each should be entirely sufficient for satisfactory control in normal flying and in maneuvers under the various load conditions, and the stick control motion should be such that a normal pilot can, without reaching, place the stick in any permissible position, particularly with the stick in its most forward position. The elevator control force should be small and the change in elevator force required for balance between power on and power off conditions should not be excessive. The elevator should retain effectiveness to the stalling point, while the rudder should be the last of the three controls to lose effectiveness in a stall and should have ample power at slow air speed without requiring excessive control force at any normal air speed. The rudder controls should be easily reached by a normal pilot with the rudder in either extreme position. Both control systems should be positive without appreciable slack or stretch.


Wind tunnel setup for spinning tests made at N.A.C.A. laboratories, Langley Field, Va.

Longitudinal position of the center of gravity affects spinning characteristics in at least two ways: through its effect on inherent longitudinal stability of the airplane, and by the relative changes caused in mass distribution and inertia moments. An airplane which is made very stable by placing the center of gravity forward of its usual position is difficult to spin, due to the lack of sufficient elevator control to properly stall it, and to the tendency of the airplane to be very nose heavy during a spin. These effects are distinct advantages from the standpoint of safety from inadvertant spins provided sufficient elevator control is provided for satisfactory normal flying maneuvers. The usual military airplane is balanced between 30 and 35 per cent of the mean aerodynamic chord and the longitudinal controls are designed to provide sufficient effectiveness for stalling, making three point landings, and getting the tail up during take-off in this range of balance location. If the balance on such an airplane is moved to 25 per cent of the M.A.C., it is generally necessary to provide more effective longitudinal control in order to stall the airplane or make satisfactory landings. A majority of the commercial airplane types have been so designed that the balance location with full load is between 35 and 40 per cent of the M.A.C. and in the cabin types particularly there is usually a large change in balance location between the full load and empty conditions. This is undesirable both from the standpoint of control and longitudinal stability and has undoubtedly resulted from the fact that more attention has been paid recently to building than designing airplanes. It requires careful study to design a cabin type airplane in such a manner that the mean balance location will be satisfactory and so the change in balance with various load conditions will not be excessive, however, sufficient information is available and it is essential that it be applied if airplanes are to be made safe and otherwise satisfactory for commercial use. The usual airplane requires that the balance be not further back than 35 per cent of the M.A.C. for satisfactory longitudinal stability, and for safe spinning it is highly desirable that it be nearer 25 per cent. Much has been written on the disadvantages of too much stability but these seem more imaginary than real so far as longitudinal stability is concerned, and it is certain that many of the commercial airplanes recently designed in this

country lack the degree of longitudinal stability required for safe blind flying. In order to be satisfactory, an airplane must be designed for a limited range of balance location and large changes from this range cannot be made without making corresponding changes in the design of horizontal tail surfaces.

All of the research on airplane spinning has clearly demonstrated that the center of gravity should be located well forward to insure safe recovery from spins. In special cases it has been possible to secure safe spinning characteristics with the balance as far back as 47 per cent of the M A C, but these are rare and were made possible because special consideration was given to tail controls and mass distribution in airplanes of unusual type. In most of the tests made on airplanes having undesirable spinning characteristics it has been found that by moving the center of gravity forward to about 25 per cent of the M A C. satisfactory recovery from spins could be secured. This balance location would result in a high degree of longitudinal stability in the usual airplane and would introduce special problems in securing satisfactory longitudinal control.

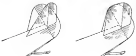


Fig. 1

In a particular case where the balance was progressively moved from approximately 19 per cent to 39 per cent of the M A.C. in an unstaggered biplane, it was at first very difficult to get the airplane into a spin and it was quite nose heavy during the spin. Recovery could be effected by releasing the controls, by placing the controls in the neutral position, by moving the stick all the way forward and leaving the rudder hard over in the direction of the spin, or by reversing the rudder and leaving the stick all the way back. The airplane was thus perfect so far as spinning was concerned, however, the longitudinal control was insufficient to overcome its inherent stability and permit three point landings to be made. Neither the stabilizer setting nor the use of ailerons had much effect on the spin. The airplane spun with its longitudinal axis inclined about 20 deg. from the vertical. As the balance was moved rearward it became easier to get the airplane into a spin and it was necessary to use more control in recovery until, with the balance at about 25 per cent M A C. the airplane would not recover from a spin with the controls released although spins could easily be stopped by reversing the rudder and elevator from the positions in which they were placed to start the spin. As the balance location was moved further aft it became progressively more difficult to stop the spins. Both the elevator and rudder forces became higher, the airplane spun with its longitudinal axis inclined at a larger angle to the vertical than previously, the spins were more irregular and slightly slower and it became necessary to use all of the elevator and rudder control motions to recover from the spins. When a balance location of about 35 per cent of the M A C. was reached, recovery required holding the stick all the way forward, reversing the rudder and holding the controls in these positions for a considerable time against high control forces in order to stop the spin. Further rearward movement of the center of gravity to about 39 per cent of the M A C. resulted in increase of control force and time required for recovery to the point where it was absolutely necessary to hold the controls in their maximum reversed positions for several turns of the spin before any tendency to recover could be noticed. Even a slight movement of the stick from its most forward position would cause the airplane to continue spinning. With this most rearward center of gravity location the airplane was longitudinally unstable and quite tail heavy in landing.

In the case of a staggered biplane in which the center of gravity was progressively moved from about 17 per cent to 39 per cent of the M A C. during spinning tests it was found that the effect on ease and certainty of recovery was approximately the same as in the unstaggered biplane, however there were great differences in the manner in which the two airplanes spun. The staggered biplane spun with its longitudinal axis inclined about 55 deg. to the vertical when balanced at 17 per cent M A C. and the spin became steeper as the center of gravity was moved rearward. This airplane also spun slower under all conditions of balance although the change in speed of rotation with change in balance location was about the same in the two airplanes. Due to the steepness of attitude of spins with the most rearward balance location in the staggered biplane, recovery generally ended in a dive slightly beyond the vertical which would be an element of considerable danger near the ground.

In many other cases of tests on both biplanes and monoplanes the beneficial effect in a spin of a forward location of the center of gravity has been demonstrated. The exact center of gravity location which will insure easy recovery from spins cannot be specified for all airplanes because there are several other important factors to be considered; however it is apparent that, in cases where safe spinning characteristics are essential, the center of gravity should be located ahead of 30 per cent of the M A C. It is almost always easier to move the balance location rearward in a completed design than it is to move it forward.

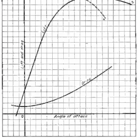


Fig. 3

In the case of cabin monoplanes it is probable that center of gravity location is of more importance than in biplanes because the tail surface controls are affected more by the presence of the large closed body ahead of them and the airflow over the wing is subjected to greater disturbance. The effect of change in angle of attack of the airplane on tail surface controls is generally more pronounced in this type than in biplanes. Another factor of probable importance is the large vertical fin surface usual in a cabin airplane.

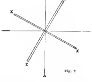


Fig. 2

The effects of mass distribution in an airplane on its spinning characteristics are confined mainly to the spin after it has been started, although mass distribution has an effect on the inherent tendency to spin through the effect of center of gravity location and longitudinal stability. In the majority of airplanes the large masses are located in the fuselage. The moments of inertia about the three mutually perpendicular axes are therefore usually different and when the airplane rotates as in a tail spin, inertia forces are set up tending to bring the system into equilibrium which generally requires some change in attitude of the airplane. In the usual case where there is relatively little distribution of weight along the vertical axis and where there are large weights in the fuselage at a considerable distance from the center of gravity the inertia forces resulting from a spin tend to make the airplane spin flat or with the fuselage rotating in a horizontal plane. This effect of inertia forces is counteracted to some extent by aerodynamic forces and an approximate condition of balance between them is reached when a fairly constant attitude is maintained. Recovery from the spin requires that the elevator control be sufficiently powerful to overcome these inertia forces as well as the aerodynamic forces tending to maintain the spin. Although moments of inertia of the airplane can be determined, it is difficult to determine the axis of rotation of a spin and the magnitude of the inertia forces involved. Rough approximations which have been made in certain cases indicate that they may be very large especially in fast spins. Most pilots have experienced the effects of centrifugal forces in spins or in quick maneuvers and appreciate how quickly such forces increase under certain conditions and how great their effect may be in preventing the pilot from exerting the necessary force on controls to recover a normal flying attitude.

THE EFFECT of mass distribution along the wing span has been investigated in a staggered and an unstaggered biplane for several balance locations. In the case of the staggered biplane it made very little difference in the spin or in ease of recovery when quite large weights were placed on the wing at a considerable distance from the fuselage. The moment of inertia about the *X* and *Z* axes was increased by approximately 50 per cent over the normal values with relatively small increase in moment of inertia about the *Y* axis. The difference in spinning characteristics due to change in balance location was not appreciably affected by increased weight on the wings.

In contrast to this, the effect of placing additional weights on the wings of the unstaggered biplane was immediately apparent and caused considerably greater difficulty in recovery from spins. The moment of inertia about the *X* and *Z* axes was increased by only approximately 20 per cent for two different balance locations before recovery from spins became very questionable. Although these tests indicate that positive stagger is desirable from the standpoint of safe spinning it should not be assumed that these results would apply with equal force to all cases as the two airplanes differed in many other respects.

The limited experience which has been had in spinning two-engined airplanes with an engine on each side of the fuselage, has usually resulted in the pilot being very well satisfied with one such experience and, generally, recovery from these spins has been effected by using the inside engine to assist in stopping the rotation. No exact data are necessary to show the desirability of keeping the moments of inertia of an airplane low by making it compact, but it is highly desirable that more information be secured on the effect of the relation between moments of inertia about the three axes. The following moments of inertia were determined for the two airplanes discussed above:

	Unstaggered Biplane		Staggered Biplane
	Calculated	Experimental	Experimental
X axis	4000 slug ft^2	6047 slug ft^2	4965 slug ft^2
Y axis	4400 slug ft^2	5404 slug ft^2	4734 slug ft^2
Z axis	6503 slug ft^2	6585 slug ft^2	5027 slug ft^2

Calculations of moments of inertia from the detail design data, even though very carefully made, are subject to inaccuracies but may be much more reliable than experimental determinations unless these are carefully and intelligently made. In general where a compound pendulum suspension is used, the length of suspension should be short as quite small errors in length of suspension introduce large errors in the moment of inertia determination. In a particular case, 0.1 per cent assumed error in the period and length of suspension cables resulted in 7.88 per cent difference in moment of inertia. The same assumed errors for a length of suspension cables 57 per cent shorter resulted in a 2.7 per cent difference in moment of inertia.

Moments of inertia about the *Z* and *X* axes are the most important and it is the difference between these two moments of inertia about fixed axes in the airplane which causes difficulty. In Fig. 2, if the system is placed in

rotation about the axis *A-A*, there will be a tendency for *Z-Z* to rotate until it is perpendicular to the axis of rotation. This will occur unless *Z-Z* is made to coincide with the axis of rotation *A-A*, but any slight displacement from this position will cause it to swing to a position at 90 deg. to *A-A*. The condition is thus one of unstable equilibrium. If the moments of inertia were reversed, *X-X* would tend to rotate until it reached a position at 90 deg. to *A-A*. This applies in principle to the spinning airplane, although the axis of spin is not generally through the center of gravity but is at some indeterminate and variable location on the inside of the spin, which makes calculation of the dynamic couple only very roughly correct. In the usual airplane I_Z will be larger than I_X and a dynamic couple will be created which will cause positive rotation or an increase in stalling attitude. It will be noted in the experimental determination of I_X and I_Z given above, that there is little difference in the staggered biplane but an appreciable difference in the unstaggered biplane, especially if the calculated values are used. This may have accounted for the difference in their attitudes in a spin.

To assist in insuring safe spinning qualities, moments of inertia should be kept small by making the airplane compact, and particularly the difference between I_Z and I_X should be small since the magnitude of inertia stalling moments is determined by this difference, the attitude of the airplane, and the rate of rotation. In practice, any airplane in which the elevator control force reverses as the spin continues, that is, where the pull on the control stick becomes zero and a forward pressure is necessary to keep the stick from coming all the way back, should be brought out of the spin immediately. It should be noted that the effects of center of gravity location and inertia moments must be considered together since changes in center of gravity location are usually made by shifting loads in the fuselage which also changes the moments of inertia.

It is well known that the fundamental cause of tail spins lies in the possibility of autorotation. The comparatively sudden reduction in lift force, or, more exactly, normal force on a wing just beyond its angle of maximum lift, is responsible for the possibility of a rotation being automatically maintained after it is once started. This fact has been repeatedly demonstrated both in theory and experiment and it has been shown that changes in shape of the lift curve near its maximum have a marked effect on autorotation. If instead of abruptly falling off beyond the maximum, the lift curve could be made to remain at approximately its maximum through a considerable range of angle of attack followed by a gradual reduction in lift forces as in Fig. 3b, the probability of spinning would be greatly reduced. The unusually large angle of attack necessary for autorotation under such conditions would tend to eliminate spins in the normal airplane, since it would not have sufficient longitudinal control to reach such a large angle of attack. However, if a spin did get started it would probably be very difficult to stop due to the abnormal attitude. Most of the research on airfoils has been directed toward obtaining a higher maximum lift with low drag and the most efficient airfoils exhibit a sharp peak in the lift curve. Various combinations of airfoils can be made to modify this feature but no airfoil or combination of airfoils has so far been developed which combine high lift, low drag, and the absence of a peak in the lift curve. A few airplanes using airfoils with comparatively flat top lift curves have been built at a sacrifice in aerodynamic efficiency. Others have been built to accomplish the same purpose by providing longitudinal controls insufficient to permit stalling the airplane; however, this is obviously dangerous practice. Modification of wings by the use of wash out at the wing tips or by changes in plan form intended to delay stalling of the outer portion of the wings, benefit mainly by decreasing the probability of inadvertant spinning and decreasing the rate of rotation during a spin.

The use of auxiliary surfaces or controls such as flaps and slots has been advocated as a certain cure for spinning difficulties, and a large amount of experimental development has been carried on, particularly in England where a large number of airplanes have been equipped with automatic leading edge slots. These are operated by the air force on the wing in such a manner that at large angles of attack they are opened thereby delaying the breakdown of smooth airflow over the wing and increasing the lift. At low angles of attack they are closed and conform to the contour of the airfoil section used so that aerodynamic characteristics at normal angles of attack are practically unaffected. In a spin the inner wing operates at a higher angle of attack than the outer and the slot on the inner wing is presumed to increase the lift and assist in recovery. Actually the angles of attack are sufficiently high on both wings that generally both slots are open during a spin. In the initial stages of starting a spin these slots do assist in preventing the airplane from rolling and provide increased lateral stability and control, thus increasing safety to some extent by preventative action. By incorporating a locking feature which enables the pilot to bring into action only the slot on the inner wing during a spin, some aid in recovery may be expected, although it must be remembered that the open slot also increases the wing drag. The development has not yet reached the point where a designer can be assured of correcting spinning difficulties by the use of slots.

The use of auxiliary devices intended to provide increased lift or drag on parts of the airplane where the results would be beneficial in recovery from spins is not desirable unless they can be made entirely automatic in action, as the pilot cannot be expected to operate any additional controls during a spin. It is to be hoped that no further addition will be necessary to the mechanism of an airplane as most of them are needlessly complicated at present.

Present knowledge of spinning indicates that adherence to sound fundamentals in airplane design and the application of a few general principles should produce satisfactory results. The center of gravity should be kept well forward, ahead of 30 per cent of the mean aerodynamic chord. This will also assist in securing proper longitudinal stability. The moments of inertia should be kept small, particularly the difference between moments of inertia about the vertical and longitudinal axes. All of the controls should be effective and easily operated under all normal conditions and especially at large angles of attack. Stagger should be used in a biplane and possible interference effect between horizontal and vertical tail surfaces in a spin should be considered in determining thir shape and relative location. It must be admitted that application of existing knowledge still leaves some element of doubt which only well directed research will dispel. Every encouragement should be given competent research organizations engaged in solving this problem.

THE *Flat* SPIN

By Lieut. Ralph A. Ofstie

U. S. Navy

The present paper by Lieutenant Ofstie and the preceding one by Captain Sutton admirably supplement each other, having been based upon studies of different types of planes and different methods of testing, and also treating the subject from somewhat different points of view. Captain Sutton dwelt especially upon the general theory of spinning and the way in which changes in design affect spinning characteristics. Lieutenant Ofstie concerns himself particularly with the practical operation of planes with abnormal spinning characteristics, and with the general place of the spin in present day aerial operation. Lieutenant Ofstie, now attached to the flight test section at the Naval Air Station at Anacostia, has had a varied experience as a naval aviator.

As a general proposition it is true that any airplane which can be sharply stalled can also be made to spin. Further it may be frankly stated that a large number of the smaller military and commercial aircraft which have been recently flown can be made to "flat" spin, although sometimes with difficulty and under somewhat unusual conditions as to loading, balance, and control disposition.

There seems to be but little agreement as to the proper terminology for this subject; in any one group of pilots it may be referred to as the reversed or inverted control spin, autorotation, stable spin, or uncontrollable spin. All of these, however, refer to one and the same thing. "Flat" spin has been selected to cover the case because it is perhaps the most generally used, although very few flat spins are, strictly speaking, actually flat, nor do they even approach that attitude.

It has been recent newspaper practice to refer to the "deadly" flat spin as though it were something quite new on the aviation horizon, and a characteristic which immediately condemns the airplane in which it is encountered. It is quite true that a goodly number of pilots have lately been killed by crashing from prolonged spins which obviously were uncontrolled. But it is entirely probable that the flat spin has been with us just about as long as the conventional spin of years gone by, and that merely advancing knowledge—and more spinning—have brought up the recent determination of exact phenomena which differentiate the flat spin from the ordinary garden variety. In any case the flat spin is definitely with us, and an endeavor is made in this paper to present some practical information relative thereto which has resulted from somewhat extended spinning experience, and to offer certain criticisms of the present general attitude on the subject.

The exact details of entry into a flat spin vary rather widely between types, and may be noticeably different as between two planes of the same type and loading. Generally speaking, however, the entry occurs as follows: the plane is stalled as for its normal spin, usually in a level stall, but sometimes rather abruptly. Full up elevator, and full rudder in spinning direction are retained thereafter. The plane is held in the conventional spin, normal for the type, for from two to six or more turns. A normal airflow passes over the control surfaces, tending to move them toward the neutral position. Then follows a brief period of transition, perhaps one turn, after which it will be observed that the nose of the ship has raised anywhere from a very small amount up to as much as 60 deg., in the latter case being probably almost on the horizon. The inside wing is lower than the outside; a peculiar whistling sound is noticed, caused by the air stream striking streamlined wires and exposed objects at unusual angles; the engine vibrates as though the propeller were out of balance; the pilot may feel himself pushed against the back of the seat by centrifugal force; and finally, the control forces are reversed—let go of stick and rudder and they stay full over, and in addition the inboard aileron (now moving backwards) takes charge to the extent of pulling the stick to the inboard corner. This is the "flat" spin, and unless some radical action is taken the spin will probably remain flat and perfectly regular in its rotation until the ground comes up and stops the whole proceeding.

Actually, what has happened? To start with, in the normal spin, the plane has been held in a stall by the elevators, over which a normal airflow has been passing. At the same time, the plane has rotated about an axis well beyond its nose—a sort of helical descent with the wing surfaces at an average angle of attack only slightly beyond the burble point of the airfoil. Recovery from this condition requires merely that the stall be discontinued (elevators moved down to reduce angle of attack and permit greater forward speed), and that the turning movement be stopped with the rudder. Both of these controls are quickly effective because they strike the airstream in a normal manner, except at a somewhat reduced air speed. But all these conditions change when the flat spin takes charge. The center of rotation has moved back to a point within the airplane, usually near the center of gravity; the angle of attack of the wings may now range from a small positive angle at the outer

tip to 90 deg. near the center section and nearly 180 deg. at the inside wing tip (that is, the inside wing is moving backward with reference to the surrounding air), the elevators and rudder, instead of being held hard against a normal airflow by the pilot, are now held against the pilot by an unusual airflow; the engine thrust line, instead of being reasonably near the flight path, is now almost at right angles to it, and the propeller tries to do its work at most abnormal angles. These conditions all combine to cause the peculiar characteristics which the pilot recognizes as the flat spin.


The last turn of a flat spin. Fig. 1

The flat spin sounds rather bad, and sometimes it is. Certainly the first experience, at least in some types of planes, is decidedly disconcerting. But unfortunately the usual recovery follows the book for normal recovery, slightly emphasized: push the stick *to the dash,* with full opposite aileron and rudder. The "nicest" of the flat spinners will recover in slightly less than two turns, some want about three, a few require a half dozen, and an occasional one simply will not respond to this treatment. The latter case is discussed later; the rule which holds in the very large majority of types, however, is to push the stick to the far corner, boot the rudder hard over, and *hold them there.*

To show the relatively wide variations possible in the spinning characteristics of different types the following examples are cited: the planes in all cases being biplanes, carrying full load, and all recovering from their *normal* spins in about a half turn:

(a) Two-place, high performance. Plane enters a normal spin quite readily. Makes about five extremely fast and regular turns with nose almost vertical, then slows down appreciably with nose rising about 20 deg. The normal spin is faster and much less comfortable than the latter flat spin; recovery, however, requires two full turns from the latter condition.

(b) Training plane, 200 hp. class. Plane enters a normal spin with some difficulty. The first three turns are slow and wallowing, with a distinct whip (about once per turn) which successively raises the nose of the ship. After about the third or fourth whip the nose stays high, perhaps 30 deg. below the horizontal, and the speed of rotation almost doubles. Recovery takes a full three turns.

(c) Single seater, high performance. Apparently will not flat spin unless stabilizer is adjusted full tail heavy. In the latter condition the nose quickly comes up to about 30 deg. from the vertical. Recovery very difficult, effected in two cases by pilots attempting to leave ship (with parachute) and, on moving their bodies forward and up, finding the ship came out in a dive.

(d) Light two-seater, 100 hp. Spins easily, but with nose almost vertical. At about the fourth turn nose comes up about 30 deg., and flat spin is fully developed in one additional turn. Recovery is made in two turns.

(e) A training plane with 200 hp. engine. As a landplane with stabilizer set at a small dihedral angle, this craft spins with some difficulty. Once started, however, it goes into a flat spin after about three fast turns, and recovers readily in less than two turns. As a seaplane, with the same dihedral in the stabilizer, recovery takes three turns; but with stabilizer set for zero dihedral the recovery requires about six turns.

The few examples cited above illustrates the rather wide variations in entry, attitude during spin, and time of recovery, that may be expected in a fairly diversified group of planes. But once the spins are actually "flat," whether the nose be high or low, the same conditions obtain for all: loss of thrust, reversal of control forces, and markedly delayed recovery as compared with the normal spin.

A number of types seem to be borderline cases. A small increased angle of the elevators, a few degrees negative stabilizer, a few more pounds of load back of the center of gravity, and an apparently perfect airplane suddenly becomes a flat spinner. Conversely, by setting the stabilizer positive, by keeping the load well forward, and by easing up on the stick just a small amount, an otherwise regular flat spinner can be demonstrated to have none of the characteristics of this class. The margin is surprisingly small in many cases.


Fig. 2

The military air services permit prolonged spinning in several classes of small planes, with restrictions against certain specific types in which dangerous tendencies have been encountered. Some of the planes in service, particularly of the training types, have been so modified after their initial appearance that bad spinning characteristics have been practically eliminated—at a cost, however, of some of the control and maneuverability, and with limitations on loading. The flat spin is definitely recognized, and, for all practical purposes, is accepted as bad news which must be taken with the good.

The regulations of the Department of Commerce diverge somewhat sharply from those of the military services. Their present requirements apply to open cockpit planes of less than 4,000 lb. and cabin craft of slightly less weight. Briefly they insist that planes in these categories shall recover from a six-turn spin in one and one-half turns with netural controls, no power, and no reversal of stick forces. While it is undoubtedly desirable that the spinning characteristics should meet these requirements yet it is questionable if a number of approved commercial planes honestly do so. As has been previously stated it is not difficult to present a plane for test which, due to a slight limitation on elevator throw, and moderate shift of usual loading, will be incapable of entering a flat spin. Furthermore the pilot can without much difficulty avoid the flat condition by easing slightly on the stick, particularly in planes which have a pronounced "indicator" (wobbling of control stick) just before going flat. The point it is desired to stress is that a plane type might pass the Department of Commerce tests but after getting out into flying service might develop so-called undesirable spinning characteristics, caused by slight change of local and control arrangements.


Fig. 3

But after all, why should the flat spin be so heartily and generally condemned? Deliberate prolonged spinning is almost invariably required before the airplane will go "flat." Just what purpose it is desired to accomplish, just what value the prolonged spin has, is difficult to see. Obviously every student pilot should have some spin training, but one or two consecutive turns are certainly sufficient to illustrate adequately the working of the spin and the recovery therefrom. These are deliberate spins, entered into at a safe altitude and with the pilot adequately warned as to what is about to happen. The characteristics of the ship are known, the student has been carefully instructed and checked. He spins in order to learn what to do instinctively in case of an involuntary spin.


Fig. 4

Many so-called spin fatalities are improperly placed in that category, that is, spins which originate close to the ground. Actually the ship is simply stalled, falls off to one side with perhaps a half turn in that direction, and goes in on its nose before being stabilized in a normal spin. Reduction of fatalities from this source involves more careful training in appreciation of the stall condition, and *immediate* disposition of controls for recovery of flying speed. The point is that the plane does not even start spinning, and therefore this type of crash can have no relation to the flat spin.

THE INVOLUNTARY SPIN at altitude may result from any maneuver which leaves the plane in a stalled attitude. It may occur while stunting, praticing turns or other maneuvers, or it may be caused by weather conditions in which a pilot, temporarily flying blind, has lost his sense of direction and ground relation. But once the plane has been stalled involuntarily, and falls to a spin, a qualified pilot should quickly recognize the condition and take prompt means for recovery. In the case of thick weather flying the pilot may do a succession of dives,

spirals and spins; but each time the spin is recognized he must ease his stick forward for recovery, and each time a dive is apparent (evidenced by high air speed) he eases his stick back. Of course it is not quite as simple as that, but unless the pilot is thoroughly experienced he would hardly be out attempting blind flying in dangerous weather. In any case no pilot will permit himself to stay in an involuntary spin much over a turn, and certainly, when the flat spin can be avoided by merely easing the stick forward he should encounter little if any trouble from this source.

Some pilots must make prolonged spins in the testing of new types of aircraft, and particularly training planes. Since it must be done, and necessarily has a definite element of danger, the testing should follow a routine which will limit that danger and yet permit the correct data being obtained. The test pilot should first see that his plane is rigged exactly in accordance with production specifications. This applies particularly to the angle of throw of the elevators and rudder. The plane should be flown from the most forward of the control cockpits, in order that centrifugal effect will be a minimum if a flat spin is encountered, the reason being that most ships rotate about an axis passing approximately through the forward seat in the conventional double cockpit airplane. Finally a hopper for shot ballast should be rigged in the rear (cockpit) in which variable loads of small shot can be placed during the progress of testing. The hopper is fitted with a sizable dump valve with an operating handle close to the pilot.

Fig 5—Just before the crash. It will be noted that the plane has descended over a fixed point throughout the turn

Test spins should be started at an altitude certainly on the high side of 8000 ft., and once the plane has finished half a dozen turns of a normal spin, or is settled for a few turns in a steady flat spin, recovery should be made. The normal recovery has already been discussed. If this proves ineffective after about six turns some more radical action must be initiated. Roll the stabilizer all the way forward. Next try full throttle, while retaining controls in their maximum recovery positions. Contrary to popular belief the engine is of distinct assistance in recovery from the flat spin, due to the resulting slipstream making the tail surfaces more effective and the propeller thrust acting to give motion in the flying direction. Should this be ineffective after several additional turns an attempt should be made to rock the plane out, using the engine in conjunction each time the controls are moved for recovery. It is necessary of course to work with the natural period of the plane in attempting recovery by this means, the controls being operated very much in the same manner that a sea plane is rocked on the step for takeoff. But if all the above recovery attempts prove useless the dump valve on the hopper is pulled, assuming that the plane had reached a loaded condition when trouble was encountered. This last should result in a movement forward of the center of gravity sufficient to permit normal recovery. If not, remember what parachutes are made for.

Assuming that the plane has been prepared as previously outlined, the following specific procedure is suggested in the spin testing of new types of planes. The routine tests for speed, climb, stability, etc., will have been previously completed.

The first flight is made with center of gravity as far forward as possible, that is, with pilot in front seat and no ballast in rear. Set stabilizer for balance at cruising speed. Stall the plane without power using maximum rudder and elevator. If plane goes into a simple spiral and refuses to spin, try again with full opposite aileron and negative stabilizer and a burst of the gun each time the plane whips. If none of these is effective it is apparent that the center of gravity is too far forward to admit of retaining the plane in a stall.

The next flight should be made under the same conditions as the first except that an increment of shot load should be put in the hopper. On subsequent flights this load is gradually increased until the hopper is filled, and finally the full specification load is carried. In the latter case if the flat spin has not yet developed an effect should be made to induce the condition as before by using full negative stabilizer and bursts of the throttle.

Finally if the plane does spin flat and if it has dual control, a last test should be made to determine whether recovery can be properly effected using the rear controls. For this purpose the shot hopper is removed, pilots flying in both seats with the forward man acting as safety pilot to take control in case the centrifugal force in the rear is too great to allow proper use of the controls there.

But spinning is uncomfortable, uninteresting, and frequently unhealthy. It is a maneuver unnecessary except for training operations. One can keep one's hand in on spins by very occasional practice—not more than a couple of turns consecutively—on a training plane whose characteristics have been carefully determined. Beyond that as a golden rule, adopt the policy of *never* spinning voluntarily. It gets you nothing except some day perhaps, a good crack-up.

THE *Dornier Do.X*

A Flight Experience and Some Remarks on the Operation

By Lieut. Commder. James M. Shoemaker
U. S. Navy

Performance records of the Do.X have been widely published, and many journalists have written extensive impressions of the big flying boat. Lieutenant Commander Shoemaker, however, tells of his reaction to a flight over Lake Constance from the point of view of an expert, having been in Germany as official observer for the U. S. Navy on board the Graf Zeppelin. When he writes of the performance of the Do.X, he is comparing it with a broad, scientific experience in all types and varieties of aircraft.

September fourth, 1929, was a proud day for the little town of Friedrichshafen on Lake Constance. In the morning the Graf Zeppelin sailed majestically up the Rhine and across the lake to its home hangar, where it was met and applauded by thousands of proud and happy Germans headed by members of the Reich cabinet. The ambassadors from the United States and from Japan were on hand to take part in the welcome and to receive, on behalf of their respective countries, expressions of gratitude for the assistance afforded Dr. Eckener and his crew in the world-flight just completed.

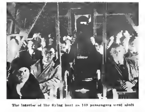
After the crew and passengers of the Graf Zeppelin had been deposited at the Kurgarten Hotel, and were smoking their first cigarettes for three days, a gradually-increasing hum of many motors was heard to the southward. In a few moments Dr. Dornier's latest product, the twelve-engined Do.X, swung overhead and glided down to a landing in the lake.

That same afternoon, the three American naval officers who had been guests aboard the Graf Zeppelin accompanied Ambassador Schurman and the official party in an inspection of, and flight in, the tremendous Do.X. Two motor boats carried about fifty people out to the plane, which had been swinging at her mooring off the town. As we approached the plane, the

The giant Dornier six-engined flying boat riding at anchor

boats were dwarfted by comparison. The passengers were landed on the starboard stub wing of the Do X, where we were met by Dr Dornier

The party was ushered into the passenger space—a tremendous compartment in the hull Shortly afterward the plane was cast off from its moorings and taxied slowly out into the lake The pilot tested out all engines for a moment, then heading into the light breeze he opened the throttles wide With sixty people on board, the plane fairly jumped onto the "step," and 33 seconds from the time the throttles were opened the plane was in the air We made a twenty minute flight along the shore of the lake, landing again in front of the town The landing was a "hot" one, with no attempt to stall the plane in We settled on the water without the slightest shock, and decelerated smoothly to a stop


The interior of the flying boat as 100 passengers went aloft

The most striking feature of the Do X, aside from its huge bulk was the ease of handling, both on the water and in the air Like the Dornier Super-Wal, the Do X has a water rudder, which is operated by a wheel alongside the pilot's seat The plane was handled on the water very easily with only two motors running As to controllability during take-off in the air and landing the pilot seemed to exert no more effort than in handling a twin-engined flying boat There are side-by-side dual controls, but the assistant pilot did not touch them during take-off and landing And the plane took off into a three knot breeze in 33 seconds with a gross weight of approximately 40.000 kilos (88.000 lb)!

CONTRARY to what might be expected there are no servo motors or other mechanical means for moving the controls Dornier balances, similar to those used on the Wal and Super Wal, do most of the work There are balances for each aileron and each of the elevators and a balance on each side of the rudder The elevator and the rudder balances are adjustable, the control surfaces themselves being non-adjustable Balance adjustment is achieved by varying the height of the balance post a separate control wheel for elevators and rudder being located alongside the pilot's seat It is noteworthy that the balances themselves are mounted on fixed airfoil surfaces, and connected to the control surfaces by linkages

The control of twelve engines by the pilot sounds like a matter of almost insuperable difficulty, but as worked out in the Do X it is certainly simple, and seemingly fool-proof The pilot has two throttles one for each side of the plane, located together outboard of his seat The throttle rods lead back to the engine room behind the navigating compartment where the engines are cut in or out of the pilot's throttes as necessary. There is a box of twelve lights in front of the pilot one light for each engine When an engine is disconnected from the pilot's throttle, this is indicated by the lighting of a lamp in the light box The engine room crew keeps the engines synchronized, takes care of fuel and oil supply watches oil pressures and temperatures, etc The pilot handles his throttles just as if flying a twin-engined plane, his only engine instruments being two tachometers


The tedious task of transporting the great flying boat overland previous to the launching


The plane fairly jumped onto the 'step,' and 33 seconds from the time the throttles were opened was in the air"

The Do X carries a crew of ten men—two pilots, two engine room men, and an engineer for each of the six nacelles These last-named men start the engines at the nacelles Before take-off the man from each inner nacelle returns to the engine room and reinforces the engine room gang, the men in each of the four outer nacelles remain in them during flight

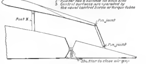
It is astounding that the roar from the twelve Siemens-Halske Jupiters is not deafening The engines are not provided with exhaust collectors and mufflers, yet the noise was not at all excessive—no more than is normally present in any multi-engined airplane One of the reasons for the absence of excessive noise is undoubtedly the low propeller speed The engines are geared, and the propellers run at one-half crankshaft speed Another reason is the use of thick-sectioned four-bladed *wooden* propellers Four-bladed wooden propellers are used on all Dornier flying boats, their fly-wheel effect giving smoother running engines

AS TO the Do X performance, Dr Dornier stated that the top speed was 212 k p h. (131 7 m p h) and the cruising speed was 180 k p h (111 85 m p h) The landing and take-off speeds have not been measured, however, the plane took off in 60 seconds in a light breeze with a total weight of 49,000 kilos (108 000 lb) The endurance at cruising speed, with a full load of fuel and oil and 100 passengers, is about six hours So well had the design of the Do X been worked out that no trouble was experienced on the first trial flight aside from the overheating of the rear engines This difficulty was corrected by a cowling modification.

Most of the fuel and lubricating oil is carried in tanks in the hull (tanks are fabricated of riveted and welded dural) Electric pumps are used to pump fuel and oil to the nacelle tanks Some difficulty may be experienced with the lubricating oil system in cold weather, due to the long lengths of oil piping Electric indicator lights installed in the engine room show when the oil level in a nacelle tank is down to its lowest safe point An engineer then pumps up more oil from the hull The oil coolers are of the usual Dornier film type The oil line to the cooler is equipped with a thermostatically controlled by pass, which cuts out the cooler when the engine outlet oil is cool.

The original Dornier factory is located just west of Friedrichshafen on the shore of the Bodensee (Lake Constance) At this factory the smaller Dornier planes are built Due to the restrictions placed on German aircraft and engine construction by the Treaty of Versailles, Dr. Dornier established a new factory across the Bodensee at Altenrhein, Switzerland, for the construction of the Do X The Treaty restrictions have been lifted, but the Altenrhein factory will continue to function Planes as large as the Do X require factory bays the size of an airship hangar

The Bodensee has its disadvantages as a flight-testing area for seaplanes Due to the lake's altitude of 1,300 ft, with a consequent reduction in air density to only 96 per cent of that at sea-level, unsupercharged engines cannot deliver their sea-level horsepower This reduction in horsepower due to altitude amounts to a total of 240 hp. for the Do X Then, too, the fact that the Bodensee is fresh water militates against the ease of take-off of flying boats designed for salt-water operation The Do X displaces two per cent more water in the Bodensee than she would in salt water, with a consequent marked increase in the thrust required to take-off



The balance arrangement of the Dornier Do X

These disadvantages of the Bodensee make the performance of the Do X all the more remarkable. When the big boat took off from the Bodensee in the light breezes which prevail there any doubt about her capacity in salt water was removed, and, with multiple engines providing a large factor of safety in the air take off performance is the best measure of the successful design of this remarkable flying boat

Mapping 13,000 SQUARE MILES OF *Alaska*

By Lieut. E. F. Burkett, U. S. N.

Executive Officer, Alaska Mapping Expedition

> *Although the 1929 Alaskan Mapping Expedition received little or no publicity outside of governmental and commercial aeronautic circles, it was without question one of the outstanding aviation enterprises of the year. During the time 677.40 hours spent in the air by four Navy Wasp equipped Leoning Amphibians a total of 13,000 square miles of northern territory was mapped. In this article, Lieut. E. F. Burkett, U. S. N., executive officer of the Expedition, relates in detail of the work accomplished, and of the personnel and equipment necessary to the success of such an undertaking.*

MAPPING of 13,000 sq. miles of southeast Alaska, not including 467 oblique photographs, tell part of the story of the 1929 Alaska Aerial Survey Detachment from Aircraft Squadrons, Battle Fleet. The survey covered principally the Tongass National Forest of which 4,000 sq. miles remain unmapped.

The photographic results of the expedition were 42 rolls of tri-lens mapping film, making a total of over 25,000 single photographs covering the area. The films have been delivered to the U. S. Geological Survey where they are filed for future use. In addition to these the negatives of 467 oblique photographs were turned over to the Forest Service. The Bureau of Aeronautics has on file the remaining negatives.

In addition to the value of these photographs in map making, they have proved of considerable value to the Forest Service. During the last two years prints made during the 1926 expedition have been in the office of the Forest Service at Juneau, where officials have realized they are of great value in estimating the area of the forests and to a large extent the quantity of timber on the areas over which the pictures were taken.

"It is impossible to estimate, in dollars and cents, the value of the results of the expedition," commented R. H. Sargent, representative of the Departments of Interior and Agriculture, and liaison member of the expedition. "In fact, it will be years before the total worth of the results can be determined. Only those who have experienced the difficulties of conducting topographic mapping by ground methods in such a country as southeastern Alaska can appreciate the invaluable aid of the mapping pictures.

"In this country, where climatic conditions are almost at their worst, topographic mapping is slow, arduous and costly, not only because of the inclement weather but also because of the heavy blanket of timber and almost impenetrable underbrush. Accurate topographic mapping by ground method is well-nigh impossible at least within the bounds of warranted cost. By such methods, the topography of the shore lines and mountain ridges can be obtained with comparative ease, but accurate discovery and mapping of the valley bottoms with the many lakes and sinuous streams is prohibitive. For this purpose the aerial photographs are invaluable and will serve to make the maps of the islands and mainland of southeast Alaska much more accurate and possible of accomplishment in much less time."

But what did the survey undertake and accomplish? After the detachment was formed at San Diego and proceeded to Alaska aboard the *Gannet* and a covered barge, and in the air in four Wasp-powered Loening Amphibians, the mapping planes flew 242.95 hours while undertaking mapping runs. Possibly the following data will be illuminating:

Hours in the air for all planes, 677.40
Miles flown by all planes, 54,182
Gallons of gasoline used by all planes, 16,887
Hours in the air for photographic mapping, 242.95
Miles flown for photographic mapping, 19,436
Gallons of gasoline used for photographic mapping, 5,105
Rolls of tri-lens mapping film exposed, 42
Number of tri-lens mapping exposures made, 7,980
Rolls of "D" or fourth lens mapping film exposed, 10
Number of "D" lens mapping exposures, 1,900
Number of mapping negatives, 25,840
Number of square miles covered by photographic mappings, 13,000
Number of prints made from mapping negatives, 600
Hours in the air for oblique photography, 95
Miles flown for oblique photography, 7,752
Gallons of gasoline used for oblique photography, 2,256
Number of aerial oblique exposures made:
    For Bureau of Aeronautics, 225
    For other Federal Bureaus, 467
Number of prints made from oblique exposure, 5,600

Three of the Loening Amphibians of the Alaskan Survey Expedition in a formation flight

THE PLANES few overland from San Diego to Seattle enroute to their operating bases, but with few exception the regular steamer route via the inside passage was followed on the flight from Seattle to Ketchikan, due to the fact that it is usually over well protected water and in case of a forced landing assistance would be more readily available.

As the distance between Seattle and Ketchikan could not be covered in one flight, Alert Bay, B. C., 264 nautical miles northwest of Seattle in Johnstone Straits was selected as the logical refueling point. All four planes of the detachment were taxied up on the beach. Although Alert Bay under present conditions is considered the more feasible stop-over point for planes flying between Seattle and Ketchikan, there are several other well protected harbors along this route where aviation refueling facilities are available.

Insofar as general conditions in southeastern Alaska are concerned, later experiences gave a clear-cut and positive proof of the adaptability of a rugged amphibian such as the Loening for this work. No suitable land fields were available. Unusually deep water and an extreme tide range of 24 ft. with resulting strong currents in the channels along which the most important cities are located usually made anchoring the planes impracticable.

At bases where sufficient dock space was available the planes were secured on the dock, the *Gannet* hoisting them to and from the water as operations required. Where deck space was not available, the nearest suitable beach was selected and cleared, the planes landing on the water and taxiing out on the beach under their own power. It is in connection with such operations that the value of the characteristics of the amphibion type of plane is fully realized and appreciated. The best beaches were barely large enough, the water coming up to the axles of the planes during the extreme high tides which occurred for a few days each month.

At Juneau, the *Gannet* and barge were moored to the Government wharf and the planes secured on the wharf. This wharf was in excellent condition and equipped with telephone, water and power connections which were made available for the use of the Detachment. The operating conditions were very satisfactory and permitted concentration of all units of the detachment. The officers and crew of the *Gannet* became extremely efficient in handling the planes to and from the dock, and always gave excellent cooperation in the work to be done.

Before the summer was over, all four planes could be hoisted from the water and secured on the dock within 12 min. This became a vital factor in cutting down the interval at noon between mapping flights as the summer passed and the time limit for actual photography was reduced. Aviation gasoline and oil in 50 gal. drums was delivered to the dock by the Juneau branch of the Standard Oil Company of California.

Operating conditions at Ketchikan compared favorably with those at Juneau and photographic work was carried on with a minimum of lost motion. Aviation gasoline and oil in 50 gal. drums was delivered to the dock by the Ketchikan branch of the Standard Oil Company.


Surveying a region valuable for tremendous timber resources

During the summer in southeastern Alaska each plane was given the regular 20 hour check as required by existing instructions and it was largely due to the care and thoroughness with which these were carried out that engine failures were entirely eliminated. During rainy weather, which frequently occurred when the planes were due for this check a canvas tent fly was rigged over the engine and the check carried out, assuring the readiness of the plane for the next mapping weather.

Excellent performance was obtained from the four Pratt Whitney air-cooled Wasp engines, and all four planes completed the summer's work without a change of engines. In view of the unfavorable operating conditions due to limited beach space, lack of shelter, rapid temperature changes and heavy rainfall it is considered that both the planes and the engines withstood the rigorous test remarkably well.

Although beset with frequent and heavy rains, the detachment was ready to commence photographic operations on the day of our arrival at Ketchikan on May 24. Although photographic operations could have been carried on from Ketchikan, it was decided to move nearer the area to be mapped. An aerographer, with complete equipment for taking upper air soundings and for making a daily weather map and forecast, proved his worth at this stage of the operations. Unfavorable weather for photographic flights was predicted for the next few days, but on May 29 we had reached Petersburg and were ready to operate.

From Petersburg the islands of Kuiu, Coronation, Warren and the southern half of Baranof were mapped. After investigation and comparison of the facilities at Sitka and Juneau it was decided to shift the detachment from Petersburg to Juneau for the remainder of the work to be done in the northern half of the Tongass National Forest. On June 17 the entire detachment moved to Juneau, and while operating from this base the northern half of Baranof and the islands of Chichagof, Kruzof and Yakobi and portions of the mainland were completed.

After operating from Juneau for two months, the detachment departed on August 17 for Ketchikan, arriving there two days later, after stopping at Petersburg over Sunday in a downpour which continued without cessation for seven days. When the weather finally cleared, the detachment mapped sections of the mainland between Behm canal and Portland canal and a few scattered areas to the north along Stephens passage.

Although there was much rain during the summer, the weather usually was the same throughout the area, although occasionally we were able to locate a clear area despite apparently unfavorable conditions. With this in view, it was important to arrange for weather reports at least twice daily from as many local stations as possible. On one occasion while based at Juneau, four successful mapping flights were made in the vicinity of Glacier Bay where it was cloudless, while at Juneau and to the southward the area was cloudy with occasional rain.

If the weather were unsuitable for mapping in the morning, it seldom cleared sufficiently during the day to permit mapping operations. Frequently the weather was clear enough for mapping early in the day, but clouds formed by noon. The first mapping weather after a rain was usually extremely clear, but a day later the weather, even though cloudless, became slightly hazy with the haze increasing in density with the passage of each clear day. During our stay the following eighteen days were clear enough for mapping: May 30, June 4, 5, 6, 15, 23, July 10, 11, 17, 18, August 1, 2, 3, 4, 5; September 1, 5, 6. Of our 104 days in Alaska, rain fell on 73!


Lieut Burkett, Comdr Radford and Lieut Whitehead (left to right, standing) with five enlisted photographers


Officers and crew of the 1929 Alaska Mapping Expedition at Juneau

Three precautions were taken to insure the safety of any mapping crew. First, of course, the route of the flight was definitely determined in advance, with alternative flight lines in case of foul weather. Second emergency rations were provided each plane to feed its crew in case of a forced landing at any distance from a base.

Each plane was equipped with the standard navy medical aviation first aid kit, and with a stock of emergency rations in an ordinary give gallon tin, the top closed and soldered to make it entirely water tight. The rations included: 3 lb. can sausage, 15 pieces hardtack 2½ lb. bacon, 2 lb. died fruit, 2 lb. coffee 2 lb. sugar 2 candles, salt, pepper, 2 pieces paraffin soaked paper for making fires, 3 lb. can corned beef, ½ lb. butter, 2 lb. sweet chocolate, 2 lb. cheese, 1 carton cigarettes, 1 tin of sulphur matches, fish hooks and line, 1 can for making coffee.

Two of the four planes carried radio equipment. In making plans for the survey some difficulty was experienced in deciding just what aircraft radio equipment was desirable and necessary. It was finally decided to requisition two SE 1385-A transmitters and two SE 2465-A receivers, and an SE 1376-B transmitter receiver. Two of the planes were wired for radio equipment before leaving San Diego, but radio sets were not carried between San Diego and Seattle.

Only a few minor radio troubles developed. Two fans developed vibration and were replaced while the CW 1344 tubes after being in use a short while would become paralyzed or lose their life. Care was taken to insure that the tubes operated at their normal filament-voltage rating according to their tip coloring but the reason for their going dead could not be determined. This necessitated carrying plenty of spare tubes in the plane.

An improved installation of the antennae reel and lead out insulator should be made as the present one causes too much strain on the reel. On one occasion the reel handle broke and on another the reel mount broke, thus requiring the operator to haul the antennae in by hand and pile it in the bottom of the cockpit. In fitting out another expedition for work in Alaska, the plan of taking two of the most powerful and rugged aircraft sets available should be followed. The smaller sets are almost useless.

Practically all flights required operation at distances well over 100 miles under atmospheric conditions generally very unfavorable. No high frequency set was available for this expedition. The excellent results obtained with the aircraft radio were due in a large measure to the efficient cooperation of the Canadian government, the U. S. Army and U. S. Navy radio stations.

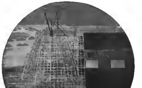
While our most important operations were carried on in the air this could not have been accomplished without a base. Immediately after the 1929 expedition had been authorized, the Puget Sound navy yard commenced overhauling covered barge YF-88. This barge was originally a standard 110' by 30' navy ammunition lighter but had been converted for use as living quarters workshops, offices, store rooms and photographic laboratory for the aviation detail of the 1926 expedition. The barge was equipped for hot and cold running water and wired for electric lights and power.

The work during the summer was performed for several governmental departments, notably the Departments of Interior and Agriculture. Lieut. Comdr. A. W. Radford was officer in charge. Other officers and their responsibilities were as follows: Lieut. E. F. Burkett, executive officer, operations, navigation and communications. Lieut. R. F. Whitehead, photographic aerological. Lieut. C. F. Greber, engineer radio, athletic. Lieut. (jg) L. P. Pawlikowski, assistant operations, flight, material. Lieut. Comdr. A. C. Smith (MC), medical, welfare. Lieut. E. F. Carr (SC) supply, disbursing.

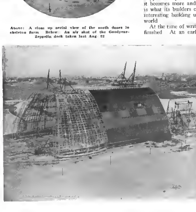
THE

Goodyear-Zeppelin Dock

AT AKRON, OHIO



Above: A close up aerial view of the south doors in skeleton form Below An air shot of the Goodyear-Zeppelin dock taken last Aug 22



By Walter E. Burton

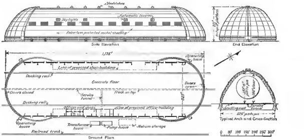
AS WORK PROGRESSES on the huge airship factory and dock being erected by the Goodyear-Zeppelin Corp at the Akron (Ohio) Municipal Airport, it becomes more and more apparent that the structure is what its builders claim to be—the most unusual and interesting building under construction anywhere in the world

At the time of writing, the dock is approximately half finished At an early date it should present a fairly complete appearance to the eyes of the spectator Work of assembling the first huge airship inside the building is to start within a short time.

The ZRS-4 and ZRS-5, two super-Zeppelins ordered by the United States Navy, will be constructed in the dock It is highly probable that other air liners—commercial ships—will be built there also It is also likely that, eventually, another dock duplicating the present one will be erected beside it At least, the company is anticipating such expansion by providing ground enough

The two new Navy airships will be the largest ever built They will be 785 ft. long and 135 ft wide, and will hold 6,500,000 cu ft of helium gas The dock is large enough to house a ship of 10,000,000 cu.ft capacity

If the new building were sliced like a loaf of bread, the surface of each cross-section would be bounded by a parabola intersected by a straight line If the slices were longitudinal and vertical, the section would be bounded by two half-parabolas connected by straight lines The overall shape is much like a silkworm's cocoon split lengthwise The building is of huge proportions Its length is 1,175 ft , measured between center lines of door tracks; its width is 325 ft , center to center of arch pins, and the height from the floor to the platform at the top is 211 ft Area of the floor is 364 000 sq ft , and cubic content of the building is about 34 000 000 cu ft



Plan drawing of the Goodyear-Zeppelin dock at Akron, Ohio

The Zeppelin shed built in 1908-9 at Friedrichshafen, Germany, is 603½ ft long, 150.8 ft wide and 65.6 ft high A later hangar built nearby is 787.2 ft long, 150.8 ft wide and 114.8 ft high. These, like most other European hangars, are of structural steel arches with sliding doors at the ends At Orly, France, are two somewhat different types of sheds They are of reinforced concrete, and are 984 ft long, 298 ft wide and 194½ ft high The largest British hangar is at Karachi, India, and was built for the proposed England-India airship service It is 850 ft long, 230 ft span, and 170 ft clear height The largest hangars in the United States other than the one at Akron are at Belleville, Ill , and Lakehurst, N J The Belleville hangar is 810x150x150 ft That at Lakehurst is 803x264x172 ft Both of the hangars have vertical, sliding doors opening from the center outward

IN DESIGNING the Akron building Dr Karl Arnstein, vice-president and chief engineer of the Goodyear-Zeppelin Corp , had some precedent upon which to work Similar structures, although on a considerably smaller scale, had been built and used in Dresden and Liegnitz, Germany A model in the general shape of the Akron building was constructed and put through rigorous wind-tunnel tests at the Daniel Guggenheim School of Aeronautics of New York University The model was 1/240 the size of the completed dock Tests were conducted by Dr Arnstein and Dr Wolfgang Klemperer, the latter also of the Goodyear-Zeppelin Corp Working with the knowledge that wind, in striking a building and being deflected upward, creates a suction that tends to force the roof of the structure upward, they found that the dock would have to be braced against tremendous force acting from the inside Suction forces of this type sometimes are several times the magnitude of the wind pressure on the outside Dr Arnstein's experiments indicated that the outward force should be assumed at not less than one-half the inward, and that the roof should be secured locally against outward forces equal to the maximum direct pressure This practice of designing a building to withstand pressure from within has not been applied extensively in America, suction being almost wholly neglected in structures erected prior to the Akron dock

MEASUREMENTS made at the Lakehurst hangar revealed that it is unsafe to dock an airship when a cross-hangar wind is blowing more than 10 m p h This velocity creates about the open, sliding-type doors, currents of twice the initial wind velocity, or 20 m p h Therefore it is evident that, if the door currents can be brought to the same velocity as the cross wind, a 20-mile blow can be tolerated, or an effective increase in usefulness of the dock by 100 per cent obtained.

It was this factor which led to adoption of the "orange peel" type doors for the new dock They are designed so that a minimum of troublesome air currents is created, regardless of the door position.

Early in the airship's development it was learned that the hangar should be placed so that its longitudinal axis is parallel to the prevailing wind direction The Akron building is orientated to north 30° east by south 30° west, approximately

Calculation of loads and stresses for the building was in itself a huge task The values finally arrived at include the following:

Dead loads—On arches 30 lb per sq ft On sheets rafters and purlins 10 lb per sq ft On laterals, 20 lb per sq ft

Snow loads—On all surfaces having an inclination of less than 45 per cent to horizontal 30 lb in combination with dead load only, and 15 lb in combination with maximum load

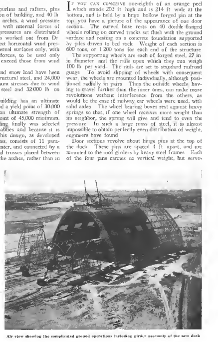
Wind load—On all sheets purlins and rafters, plus 80 lb per sq ft for upper portion of building, and 40 lb for lower On all bracing and arches, a wind pressure of 37½ lb per sq ft combined with internal forces of plus 12½ lb, is allowed, and pressures are distributed according to pressure diagrams worked out from Dr Arnstein's experiments A direct horizontal wind pressure of 15 lb per sq ft on external surfaces only, with no consideration for internal forces, to be used only when stresses due to this load exceed those from wind load

Working stresses for dead and snow load have been set at 18,000 lb per sq in on structural steel, and 24,000 lb on silicon steel For maximum stresses due to wind load, 24,000 lb on structural steel and 32 000 lb on silicon, are the values

Carbon steel used in the building has an ultimate strength of 55,000 to 65 000, and a yield point of 30,000 minimum Silicon steel has an ultimate strength of 80,000 to 95,000, and a yield point of 45,000 minimum.

General design of the building finally was selected because of its aerodynamic qualities and because it is economical in steel weight This design, as developed by Wilbur Watson & Associates, consists of 11 parabolic arches spaced 80 ft on center, and connected by a system of vertical and horizontal trusses placed between the upper and lower chords of the arches, rather than in the plane of the arch cords These trusses, in addition to forming the webwork of bracing for the outer shell of the dock, carry light trussed rafters spaced 10 ft on center, and on these are placed Z-bar purlins 8 ft on center. At each end of the main shell portions are two diagonal arches, meeting the end arch pins which are 800 ft apart. The orange peel doors are built up in a similar way, of arches and braced ribs All materials are of structural steel, except chords of the main arches which are manufactured with silicon steel

Two of the outstanding features of the design are the novel type of doors used and the absence of expansion joints in the building Of course, such a large all-steel structure will undergo a considerable change in overall size with fluctuation in temperature Therefore, the center arches are fixed in position, while the remaining ones are carried on rollers This permits the building to "stretch" and contract, much like a giant animal after a nap. The end arches, supporting the upper door hinges, will move laterally about 4 in under the maximum range of temperature This motion is absorbed partly on the pins of the hinges and partly by the door structure



Air view showing the complicated ground operations including girder assembly of the new dock

If you can conceive one-eighth of an orange peel which stands 202 ft high and is 214 ft wide at the bottom, and is held by a huge hollow forged pin at the top you have a picture of the appearance of one door section The curved base rests on 40 double flanged wheels rolling on curved tracks set flush with the ground surface and resting on a concrete foundation supported by piles driven to bed rock Weight of each section is 600 tons, or 1 200 tons for each end of the structure

The supporting wheels are each of forged steel, 27 in in diameter and the rails upon which they run weigh 100 lb per yard The rails are set to standard railroad guage To avoid slipping of wheels with consequent wear, the wheels are mounted individually, although positioned radially in pairs Thus the outside wheels having to travel farther than the inner ones, can make more revolutions without interference from the others, as would be the case if railway car wheels were used, with solid axles The wheel bearing boxes rest against heavy springs so that, if one wheel receives more weight than its neighbor, the spring will give and tend to even the pressure In such a large mass of steel, it is almost impossible to obtain perfectly even distribution of weight, engineers have found

An artist's conception of what the Goodyear-Zeppelin dock and factory at Akron will look like when completed (Looking northwest)

Door sections revolve about hinge pins at the top of the dock These pins are spaced 4 ft apart, and are mounted to the roof girders by heavy steel frames Each of the four pins carries no vertical weight, but serves only to prevent the door from tipping inward or outward Engineers have calculated that pressure against the pin will reach a maximum of 550 000 lb inward, and 450,000 lb outward, under the influence of snow and wind Each of the pins is 17 in in diameter and about 6 ft long The door section is fastened to it through a ball-and-socket joint, the ball diameter being 30 in

An interesting feature of the pin is that its position is not fixed. It wobbles about several inches as the building expands and contracts under temperature changes The bearing can move 4 in up and down on the pin each way, to provide for thermal changes in the door height

Moving such huge masses of metal as the door sections is no little task In opening the doors, considerable power is required to start the sections in motion Then, after they are moving complete control must be possible at all times Furthermore, the doors must not be permitted to move under wind action

These conditions led to adoption of the "rack drive" system of door operation Along the outside edge of each section, at the base, is a curved 14-in H-beam, the radius of curvature being 192 ft 10 in Pins 4 in in diameter are set along the beam on 9 in pitch The pins are engaged by the "bull" wheel of the driving mechanism

The four driving units are located on concrete bases outside the door sections They consist of a train of gears which operate a very large bull gear that engages in the door rack The gear train is driven, through a worm gear reduction, by an electric motor The worm gears are naturally self locking, so that the door is held rigidly in a given position after the motor is stopped

Each of the four door motors is built to operate at two speeds with a constant torque effort It can drive the door at a speed of 20 or 40 ft per min The motors are General Electric, 200/100 hp, 15 min rating, 600/300 r p m, 440-volt, three-phase, 60-cycle A hydro-electric brake on the armature shaft serves to stop the motor, and is set to operate with a time lag of a few seconds after power is shut off, to permit the gears to slow down

An operator desiring to open or close the doors merely presses the proper button Action from that point on is automatic Electric cutout switches set on the runway next to the driving unit are operated by projections from the door As the two leaves come together or approach the full open position, the switches are operated, and the doors slow to a creeping speed, and ultimately stop in the proper position This automatic feature makes possible the relatively high operating speed In other hangars in this country, speeds of but 12 to 15 ft per min are used

Roller bearings are not used on the door wheels because it would then be too difficult to arrest motion, once it is started It is true that such bearings would permit easier starting, but the engineers decided to employ a greater starting power rather than to complicate the problem of control in slowing down and stopping the sections It is estimated that as much as 50 tons pressure will be required to start the 600 ton doors in motion when snow and wind conditions are extreme, with the friction bearings used. Roller bearings also would not permit as high linear speed, because of the longer time necessary to stop the door motion No trouble is anticipated from snow and ice getting into the rack and gear arrangement The great pressure between the gear teeth and rack pins readily dissipates such formations. The time required for opening or closing a door is estimated at 5 min

The building is fundamentally a factory, and mechanical equipment is arranged accordingly Handlog devices are numerous, and include a 6-ton electric hoist running on a 12-in I-beam at the center of the building, overhead On either side of the center are two similar beams carrying working platforms which can be adjusted to any desired height Workmen will use these in assembling the airships Other working platforms are carried on I-beams farther down the curved building sides

A fixed working platform extends from one end to the other of the building, in the center On each side are six catwalks, each 2 ft wide, running the entire building length These are located between the chords of the arches Access to the upper platform is by two stairways, one on each side near the center There is also a specially-designed inclined railway for men and materials Two counterbalanced cars run on a curved track but in such a manner that each car is horizontal at all times The cars can be operated from the top of the railway or from either car

The building width between arch pins is 325 ft, but only 240 ft of this space will be required for assembling one of the Zeppelins The remaining area of about 42x640 ft on each side will be taken up by shop and office equipment At first shops will be confined to the

eastern side only, but eventually both sides will be used. Because of the contraction and expansion of the main building, the shops will be entirely independent structures —virtually buildings within a building They will of course, be fireproof in construction

The main floor will be used for assembly of duralumin ship girders and rings into the hull framework, and therefore it must be level and must provide support for holding down clamps The material finally selected as most suitable is reinforced concrete, 6 in thick, on a 6-in rolled slag base. Inserts for holding down clamps and holding down rings are provided

No attempt will be made to heat such a large building —that is, as a whole The shops along the sides will be heated by independent gas-steam radiator units Electric heaters will be employed locally on the assembly floor when necessary

Daylight plays but a small part in lighting the interior. There is a row of skylights on each side, but the illumination they admit is insignificant for two reasons First, much of the work on dirigibles will be done at night, and, second, the structure of a partly-finished ship will cut off much of the light Furthermore, the presence of a large number of skylights would make it difficult to maintain a leak-proof roof. Therefore, electric lights will be used almost entirely

The roof is interesting, not because it forms the greater part of the building, but because it is of unusual construction Wood was considered as a material, but was excluded by fire underwriters The material to be selected had to be non-burning, water-tight, inexpensive, and must provide the maximum amount of insulation against sudden temperature changes, as well as to meet certain strength requirements Furthermore, it was decided to reduce the cost of the building by insulating only a 100-ft strip along the top for the present, with provisions for extending this insulation down the sides if necessary Reason for the insulation is to reduce the danger of damaging the ship, especially the fabric, from the moisture condensation on the inside of the building

Robertson Protected Metal, consisting of corrugated-steel plates of "V" cross section coated with an asbestos-asphalt preparation, is used Insulation consists of ⅞ in of "Insulite" covered with tar and gravel roofing

ERECTION of the airship factory and dock presented a problem for fire underwriters They never tackled anything like it before The use of incombustible materials only was specified Then a system of outside fire hydrants, encircling the building in a huge ring, and a boosting pump for raising the 50 or 60 lb of city water pressure to 125 lb were provided Chemical fire extinguishers are to be placed throughout the building

Only helium gas will be used in the airships to be built in the Goodyear-Zeppelin plant, and no hydrogen handling equipment is being installed Helium is now shipped from the plant that produces it in steel bottles 4 ft long and 9 in in diameter Each bottle contains 170 cu ft of free gas, compressed to 2 000 lb pressure This is equal to approximately 133 cu ft of gas at atmospheric pressure and temperature, according to Boyle's law Therefore, an airship of 6,500,000 cu ft capacity will require 38,000 steel bottles Provisions for handling such a quantity are being provided

The Navy Department is building tank cars that will hold 600,000 cu ft of helium gas each It is probable that most of the gas used at Akron will be shipped in this way The cars will be run to the dock on a railroad track paralleling it Near this track and the center of the building is being built a gas compressing and purifying plant, and nearby is a storage plant having a capacity of more than a million cubic feet at 750 lb pressure. Gas will go directly from the bottles or tank cars into the ship or storage cylinders, as desired. Gas can be taken from the airship cells by the pump and put into storage at 750 lb pressure at the rate of 1,000 000 cu ft in 24 hours If the pressure is raised to 2,000 lb for reshipment, longer time will be required. The purification plant is necessary because helium in an airship gradually becomes impure from the seeping in of nitrogen and other gases.

The storage plant is built up of approximately 100 pieces of 24-in gas pipe, each being 80 ft long Forged and welded heads close both ends The pipes are inclined slightly and the upper ends are connected to the pumps and gas cells The lower ends are connected to water lines to be used in giving the system its initial helium charge, and in totally discharging the tubes

HANDLING a giant air liner while it is being taken into out of its dock is a problem. In Germany, cables attached to the ship's hull and to trolleys which run on fixed tracks to one side of the ship are used The tension on each of the cables amounts at times to more than 5 tons applied at an angle as high as 45 deg

The Akron docking system consists of two parallel grooves set flush with the handling surface at each end of the building These grooves are much like the third rail groove used on many city electric car lines The tracks are 200 ft apart and extend 1 600 ft beyond each end of the building The grooves are 2¼ in wide, and special trolleys run in them In the center, midway between the rails is a standard gauge railway track, like any other railway line except that the rail tops are flush with the ground This track will carry a guide trolley to keep the ship properly centered in relation to the building axis

For convenience, data on the building and the engineering personnel, as released by the Goodyear-Zeppelin Corporation are listed as follows

Physical data—(approximate)—Length center to center end doors, 1,175 ft , width, center to center hinges, 325 ft , height, center to center hinges 197½ ft total floor to platform, 211 ft , interior floor area, 364 000 sq ft , cubical content, 45 000 000 cu ft , perimeter of arch, 562 ft., area of roof, 687 000 sq ft ; vertical sash, 28 000 sq ft., skylights 23 000 sq ft ventilators, eight, each 6 ft diameter piling 1 300 used each about 25 ft long carrying a maximum load of 30 tons each , concrete foundations, 7 000 cu yd , floors, 7 000 cu yd ; reinforcing steel 700 tons structural steel in shell and shops, 5 350 tons , structural steel in doors, 1 800 tons

Engineering personnel—P W Litchenfield, president Goodyear-Zeppelin Corp Dr Karl Arnstein, director of engineering , W C State, consulting engineer for Goodyear-Zeppelin Corp , Wilbur Watson & Associates, architects and engineers

No anchorage for an airship has been found better than a covered building Such a building is called a "hangar" in Germany and France, and a "shed' in England and its possessions In the United States the terms 'hangar" and "dock" are both used, but the latter is being advocated by lighter-than air men The Goodyear-Zeppelin structure is officially referred to as an "airship factory and dock"

HOW *Europe* RAN AN AIR TOUR

By R.-J. DE MAROLLES
Aeronautical Engineer
Member of the Board of Officials of the "Challenge de Tourisme International"

LIGHT PLANES have shown remarkable development in Europe during recent years, and this year the "Aero-Club de France" esteemed the time ripe for organizing a big international event to demonstrate the possibilities of modern touring machines In 1928, Ingenieur en Chef Louis Hirschauer conceived the idea of a vast competition, planned in conjunction with the Aero-Clubs of different countries of Europe His suggestion was received with a great deal of interest everywhere and the contest was inaugurated with prospects of decided success In fact despite the enormous difficulties of organization, it was conducted with excellent results, since 31 machines completed the long and severe trial

The contest is to be held yearly, under the general rules of the "Fédération Aéronautique Internationale." A Challenge Cup is presented by the "Aéro-Club de France," to be awarded for one year to the National Association to which the winner of the competition belongs

The contest is open only to two-seater light planes, as defined by F A I regulations First category, machines weighing less than 400 kg (882 lb) empty, second category, machines weighing less than 280 kg (618 lb) empty

However, owing to the necessity of more complete equipment for the lengthy Tour of Europe an allowance of ten per cent was granted, so that actually machines had to weigh less than 440 kg (971 lb) and 308 kg (680 lb) respectively The machines were weighed at the opening of the trials and after crossing the final line, in addition, they were subject to being weighed as a control at any time

The placings were determined by the number of points gained in various tests, according to the following schedule

Examination of practical qualities	40	Points
Consumption test	20	"
Reliability during tour	35	"
Speed during tour	70	"
Total	165	"

The "Examination of practical qualities' comprised robustness of construction, comfort choice of instruments safety against capsizing, wheel brakes, starting gear, dual control, parachute installation, defence against fire hazards, ease of folding or dismantling wings, as well as non-opening of the engine (sealed before the beginning of flight tests), non-use of spare propeller and wheel

The "Consumption test" was made over a closed circuit of 202 mi The maximum fuel consumed had to be less than 16 kg for 100 km (56 8 lb for 100 mi) for the first category and 11 kg. for 100 km (39 lb for 100 mi) for the second For each 400 gr. (0 880 lb) less, one point was allowed (first category), as well as one point for each 275 gr (0 605 lb) less (second category) The fuel was ordinary gasoline, of the quality used for cars, specific gravity 0 720/0 730 Oil consumption was not measured, but only a limited quantity was allowed on the basis of 2 kg for 100 km (7 09 lb for 100 mi) for the first category, and 1 35 kg. for 100 km (4 78 lb for 100 mi) for the second category

THE TOTAL DISTANCE of the tour was 3 900 mi divided into 25 stages, the longest measuring 265 mi and the shortest 67 mi The route was the following Paris, Basle, Geneva, Lyons, Marseilles, St Raphaël, Turin, Milan, Venice, Zagreb, Belgrade, Turnu Severin, Bucharest, Turnu Severin again, Budapest Vienna, Brunn, Prague, Breslau, Warsaw, Posen, Berlin, Hamburg, Amsterdam, Brussells, Paris Landing was compulsory in each of the above-named places; intermediate stops were allowed

Competitors started on the tour with a possible 35 points, penalizations were as follows for a first night spent outside one of the above places, seven points deducted, for the second night, thirteen more points deducted; if a third night out occurred, the pilot was disqualified

One stage at least had to be covered each day; if not, five points were deducted for the first occurrence and ten more for the second

As regards speed, it was calculated over the whole circuit, that is to say, total distance divided by total time obtained by adding time required for each leg Points were allowed under two separate headings a first one according to a table set out beforehand and a second

one allowing, in each category, twenty points for the fastest competitor, ten points for the second fastest and five points for the third fastest

The aforementioned table allowed no points for a speed under 52 8 m.p h and 50 points for a speed of 89 m.p h or above with an intermediate scale for the first category as regards the second category the figures were no points for 43 5 m p h up to 50 points for 79 6 m p.h or above In addition competitors were disqualified for a speed less than 46 6 m p h in the first category, or less than 37 4 m.p h in the second

The final placings grouped the two categories according to the total number of points obtained

Although somewhat intricate as it was this formula worked satisfactorily it must be borne in mind that it was the first time that light planes belonging to two different categories were to compete together and it was accordingly difficult to plan perfect rules at the first attempt

Nationality of Competitors and Planes

The different National Associations taking part were the Aero-Clubs of Czechoslovakia France, Germany, Italy, Roumania, Switzerland A notable absentee was Great Britain But it was possible for a pilot whose National Association was not taking part in the Challenge to enter under the colors of a foreign Association of which he was personally a member, so British citizens entered under the flag of the "Aero-Club de France" and others competed under German colors In all, 82 entries were filed four from Czechoslovakia 28 from France, 34 from Germany, 14 from Italy and 2 from Switzerland

Makes of planes and engines may be summarized as follows Czechoslovakia two makes with Walter 80 hp engines, Belgium, one make with Walter 85 hp engines, France, eight makes with Michel, Anzani, Renault, Salmson, Hispano-Suiza and Genet engines, Germany, twelve makes with Siemens, Argus Gipsy Salmson, Genet, Cirrus, Wright Gale and Walter engines Great Britain, two makes, with Gipsy and Cirrus engines; Italy, five makes with Cirrus, Isotta-Fraschini and Fiat engines Jugoslavia, two makes with Cirrus and Salmson engines

A "Fiat" being wheeled through the "door" during the folding test Navy men were lending a hand

Preliminary Trials

The competitors had to be at Orly Airport on Aug. 3, before noon ready for the opening of the competition 55 of the 82 machines entered turned out in time and the weighing in procedure started All ships complied with the maximum weight limit

The machines were next inspected by the judges for the award of the "practical qualities" points Out of a maximum possible total of 26 the best score was made by a Romeo 5, with 85 hp Fiat engine, receiving 18 25 points

On Aug 5, the consumption test took place on the route Orly-Artenay-Orly, to be covered twice non-stop (202) mi) The 55 competitors were dispatched by groups of four, the fastest machines first, and were soon scattered along the course Seven were compelled to retire owing to various mishaps leaving 48 machines in the running qualifier to undertake the tour itself

Performances varied to a great extent in the consumption test The best figure recorded was Nehring's (Darmstadt D 18 65 hp. Genet) 18 5 points out of 20 possible, at a speed of 97 5 m.p h , next came Wirth (Klemm 25 40 hp Salmson), 17 5 points, speed 69 1 m p h , Roeder (Junkers A 50, 85 hp Genet), speed 78.8 m p.h., and Risticz (Junkers A 50 85 hp Walter), speed 78.5 m p.h both with 17 points

The preliminary trials were now over before the start of the tour the provisional positions were as follows the total number of points possible being 46

1	Kleps (Avia 11 85 hp Walter) Wirth (Klemm 25, 40 hp Salmson) Nehring (Darmstadt 18 65 hp Genet)	32 5
4	Lusser (Klemm 25, 40 hp Salmson)	30 5
5	Siebel (Klemm 25 40 hp Salmson) Roeder (Junkers 50, 85 hp Genet)	30 25

On Aug 7 the machines were lined on the field and started by groups of four at 3-min intervals, in their way to Basle Weather was very bad and pilots encountered blinding rain and windstorms

It would be too long and tedious to attempt recording the position of leading men all along the circuit The progress of various competitors soon became very confused since every one was entitled to choose at will the distance travelled each day

At the conclusion of the preliminary trials, Kleps in an Avia 11 with 85 hp Walter engine and Wirth, in a Klemm 25 with 40 hp Salmson engine each had 32 5 out of a possible 46 points Four other competitors had more than 30 points

On Aug 7, the machines were lined up on the field and started in groups of four at 3-min intervals, headed toward Basle Weather was bad and blinding rain and windstorms were encountered There was naturally a wide variation in speeds and positions along the way and it was impossible even to tell who was leading at any point But on Aug 14, when the final check officially opened at Orly some twenty planes were already circling over the airport waiting for the signal and as the rocket was fired, there was a dive toward the line in mass formation A total of 25 planes arrived on that day before dusk

One machine came in on Aug 15, five Aug 16 and one Aug. 17, bringing the total number of survivors to 32 though one of them was subsequently disqualified for having failed to cover a leg each day In all therefore, 31 pilots figured in the final rating

A Raab-Katzenstein R.U 25, which made the fastest time in the tour, taking off for the consumption test In the air is a Darmstadt D18 which made the best performance for consumption

The best average speeds in the first category were made by Carberry (Raab-Katzenstein 25 85 hp Cirrus) and Captain Broad (Moth, 85 hp Gipsy) with 96 4 and 95 7 m p.h , respectively In the second category Morzik (B F W M 23b 70 hp Siemens) averaged 80 2 m p h and V Dungern (same plane and engine) averaged 78 4 m p h

These four pilots also had the best scores for the tour based on speed, reliability and non-use of spare parts Carberry and Morzik had 119 points each while Captain Broad had 109 and V Dungern 106 5 points The final rating of the contestants is not yet absolutely determined, since the Italian government lodged a protest against certain competitors who were suspected of having flown over prohibited areas It is almost certain, however that the following standing will be accepted

[These results have been homologated since the article was written —Ed]

1	Morzik (Germany), B F W M23b, 70 hp Siemens	138 5
2	Capt. Broad (France) Moth 85 hp. Gipsy	135 25
3	Carberry (Germany) Raab-Katzenstein 25, 85 hp Cirrus	131
4	Lusser (Germany) Klemm 25 40 hp. Salmson	128 25
5	Guazzetti (Italy) Romeo 5 85 hp Fiat	127 25
6	V Dungern (Germany), B F W M23b 70 hp Siemens	125 75
7	Kleps (Czechoslovakia) Avia 11 85 hp Walter	124 5
8	Castaldo (Italy) Romeo 5, 85 hp. Fiat	124 25
9	Gelmetti (Italy) Romeo 5 85 hp. Fiat	122
10	Miss Spooner (France) Moth 85 hp. Gipsy	121 5

The first "Challenge de Tourisme International" is thus won by Germany, and the next one will be conducted by the National Association of that country

The Trend of Design

The machines entered this year divided themselves in two very different classes the "touring planes " with a comfortable closed cabin intended for practical use by private owners rather than for competition, and the "sport planes" where comfort was sacrificed to performance The latter won of course, although Capt Broad's plane which performed so well was a 'Coupe Moth' belonging rather to the first class

Generally speaking, British, French and Italian ships were "touring planes" most of them with closed cabins none of the German entries presented such characteristics and some were purely racing machines as the Raab Katzenstein Darmstadt Baumer and Arado-Warnemunde These last two were unable to take part in the actual contest, the first arriving too late and the second breaking in the air whilst performing aerobatics The Darmstadt was compelled to land during the Tour and sustained damages, whilst the crew was injured One Raab-Katzenstein only completed the trial

It was a disappointment not to see the two Cierva Autogiros, their performance would have been watched with interest None of them could be got ready in time

It is significant to note that machines of the second category (less than 680 lb empty) were much less numerous only 18 out of 82 entries, and 8 out of 31 finishers Such machines appear to be more suited for joy-rides and short journeys than for real touring In the hands of exceptionally good pilots, they are able to hold their own even in severe conditions, but their use for private owners is somewhat restricted Except in very special cases, the weight limit does not allow of an engine of more than about 40 hp to be installed, this appears too low to enable two people and a sufficient amount of luggage to be carried at a respectable average through any weather The cockpits are open, which does not provide enough comfort On this score, the appearance of passengers differed largely according to the type of cockpit used those travelling in open planes had to be clad accordingly, were often oil-stained and showed signs in some instances of marked fatigue On the other hand, the crews of cabin ships emerged spotless and remarkably fresh Such facts mean a great deal for popularizing aviation

In the larger class (less than 971 lb empty), the power used varied between 70 and 95 hp , planes were much more sturdy and comfortable, besides being appreciably faster. Some of the cabins were extremely roomy and well designed, allowing for side by side seats to be installed and leaving large space for luggage and spares In some instances a third passenger could be carried for short trips, or additional fuel tank allowing of a very respectable range non-stop

Technical Remarks

The monoplane scored heavily against the biplane 58 out of 82 entries (70 7 per cent) and 28 out of 31 finishers (90 4 per cent) Of these 28, 15 (53 6 per cent) were pure cantilever, the remaining 13 being of the rigidly braced type As regards wing disposition 15 (53 6 per cent) were low-wing, the rest belonging to the "parasol" type

The construction was in the majority of cases wood and fabric with a few fuselages of welded steel Some machines had three-ply covering throughout There was one instance only of real "all-metal" construction the "Junkers" which were of duralumin throughout according to the well-known practice of the firm Despite this unique feature the planes were not as heavy as might be supposed with 85 hp engines the weights do not exceed 725 lb empty, a very remarkable achievement But it is doubtful if this form of construction presents marked superiority in the case of a light plane Durability is certainly bettered but repairs are much more difficult as skilled metal workers trained to the handling of duralumin are to be found very rarely On the contrary a machine built of wood throughout is nearly as robust and, in the case of damage both material and labor are to be found easily everywhere

It must be remarked that the folding or dismantling test was not compulsory, in fact, a certain number of competitors deliberately ignored it, thereby losing some

points, for the obvious reason that they were unable to comply with requirements of the rules in this case. On the other hand, others put up remarkable performances. It was necessary to fold the wings, wheel the plane under a mock-up 'door" measuring 9.85 feet wide by 11.5 ft. high and re-erect the wings in less than 15 min. for each operation, the pilot and passenger only being allowed to undertake the task The "Moth" and "Portez" did particularly well in this respect In the opinion of the writer, the folding test should be made compulsory, a machine which requires complete dismantling to be wheeled through a gate is not a genuine touring plane and, sooner or later its owner is certain to be in trouble on this score, probably in an akward moment

The undercarriages, most of them of the split-axle large-tread type, appeared in frequent cases unable to cope with the stresses laid upon them by frequent landings on sometimes rough ground Too many hasty repairs had to be undertaken during the Tour of Europe, the welded steel, construction proved here a marked advantage over wood or duralumin Shock-absorber systems were generally of the elastic cord type, even on the all-metal "Junkers" where they are perfectly protected by duralumin sliding fairings Some planes used compressed rubber disks Wheels and tires of too small dimensions were noticeable Very few wheel brakes were used, and in certain instances, they appeared rather flimsy.

Engines Used in the Competing Planes

Not a single water-cooled engine was to be seen, as might have been predicted Of the 31 finishers 25 (80.6 per cent) were static radials and 6 (19.4 per cent in-line engines Of the 25 radials 8 (25.8 per cent) had five cylinders, 12 (38.7 per cent) had seven cylinders and 5 (16.1 per cent) had nine cylinders It must be remarked that the smallest engine represented, the little 40 hp. Salmson, had nine cylinders

All the propellers were of the wooden type, and direct driven, although some engines were turning at somewhat high speeds 2,000 revolutions and more were not infrequent. Taking in consideration the moderate speed of the machines (under 100 m.p.h in nearly every case), it would appear that a possible increase of efficiency could be secured by using reduction gears

Too many engines still require castor oil for their lubrication, for touring planes, the use of ordinary mineral oil of the type used for cars is practically a necessity.

Many machines had no starter and relief solely on propeller swinging by the passenger (who was always a skilled mechanic) This method cannot be accepted for a touring plane worthy of the name and it is desirable to draw regulations compelling entrants to use exclusively automatic starters operated from the seat, without touching the propeller in any way

The reliability of these small engines proved wonderful After elimination of all those which were insufficiently prepared, a procedure which took very short time, the remainder turned out splendidly despite the severe gruelling imposed upon them On some machines, they were called upon to deliver nearly full power most of the time, and they did it unfailingly Not only the engines proper, but all the accessory components of the power-unit functioned excellently, irrespective of make and airplane. It is significant to note that engines were sealed before beginning of the contest and had to remain so until the finishing line was passed only one competitor out of 31 failed to show unbroken seals at the end Such reliability from a number of different types of engines was not expected, even by the most optimistically minded, and the fact gave evidence of the great strides made by small engine designers

General Remarks

The contest was generally considered beforehand as much too severe for light planes; many were of the opinion that a circuit of 3,900 mi., embracing some very difficult fields, would cause disasters amongst the ranks of competitors They predicted that the number of survivors would be very small, a fact not likely to enhance the position of the light plane It was commonly estimated that the finishers would not exceed the dozen, putting things at their best

Circumstances, however, proved conclusively such views to be considerably on the pessimistic side and the promoters are to be congratulated in having given modern light planes a complete opportunity to demonstrate their possibilities in a most severe ordeal It must be admitted that nearly all the pilots were old hands although among them was a girl, Miss Spooner, and some genuine private owners But the average amateur is not likely to expect of his machine and himself one-fifth of the hectic task with which planes and pilots were faced in the Challenge Ships which emerged with flying colors from the trial are good and reliable machines capable of giving unfailing service in the hands of a normal customer, and such a demonstration has its value

The 40 competing planes lining up for the start of the Challenge de Tourisme International one of the largest and most interesting aeronautical events ever witnessed in Europe

Present light planes have their shortcomings which can be largely perfected But proof was given that a sound two-seater with ample accommodation and reasonable cruising speed does not require more than 80 hp and therefore is not so expensive to run Some figures of the consumption test are interesting to recall while on the subject The star performance may be set aside, as the "Darmstadt," which achieved it, is a beautifully designed performance job, but in no way a practical touring plane and few machines would be able to average 97.4 m.p.h. on a closed circuit 202 mi. in length with a consumption of only 61.5 lb of fuel Apart from this exceptionally good result, the averages were as follows

First category, speed about 83 m.p.h., 85 lb. of fuel. Second category, speed about 71 m.p.h., 54 lb of fuel. These figures represent roughly 42 and 26.8 lb. of fuel for 100 mi. at a fair speed, sufficient for touring purposes

Incidentally, the extreme figures recorded were First category, best 61.5 lb. at 97.4 m.p.h.; worst, 112 lb. at 99.4 m.p.h. Second category, best 44.4 lb. at 69 m.p.h.; worst, 77.9 lb. at 85.4 m.p.h.

During the tour, some patches of really atrocious weather were encountered, especially at the beginning, but the little machines gamely threaded thir way through, even the lowest-powered Some forced landings resulted, in most cases without damage It will be remembered that points were granted for pilots not using spare wheel nor propeller, contrary to expectations, only one of the 31 finishers failed to obtain maximum score on this.

Accidents during the actual contest were remarkably few and not one was serious As already mentioned, a machine broke in the air while stunting before the competition flights, and the pilot, Herr Hoffmann, was unfortunately killed He had not thought fit to take with him his parachute, which would pretty certainly have saved his life While on the subject of parachutes, it is interesting to note that the crew of certain machines, rather of the racing type, considered them as normal landing means in case of engine failure while above difficult country. Scarcely a "tourist" frame of mind!

Some of the scheduled landing fields were not too big, but take-off apparently went well even there, although certain machines were generously loaded. It must be mentioned that the "Aéro-Club de France" seized judiciously the opportunity for publishing the first "Guide for Air Tourists," a very useful booklet containing detailed information about all the airports on the circuit with detailed plans of them, location of installations, and a map showing exact position of the field in respect of the nearest town

Just off! The Junkers A50 begins the tour This machine was the only all-metal plane in the contest

The Future of the Challenge

The Challenge is planned as a yearly affair But the regulations are not unchangeable and it is certain that this year's rules will be altered for 1930 The main difficulty is the question of the two categories It would appear more logical to make two different classifications, but the contest would lose much of its value if there were to be two winners This summer, the rules tried to place the two classes on an equal footing by means of the different scales of marks for consumption and speed, but this good intention was practically ruined by a fact which rendered useless the precautions taken some of the lighter machines—the ultimate winner amongst them, of course—were equipped with engines of nearly the same power as the heavier planes. It is all credit to the designers who succeeded in keeping their structure weights so low as to permit of the use of motors nearly double the power of those used by less fortunate rivals, but, from a general point of view, the fact completely upset the balance between the two classes Something better ought to be found for next year

As regards importance of speed, some criticism was cast upon the 70 points (out of a maximum of 165) granted on this score In fact, the deciding factor for final placings was the distribution of twenty, ten and five points to the three fastest pilots on the tour in each of the two classes It seems likely that these supplementary marks for fastest times will not be used next summer

Finally, as regards the placings for awarding the Challenge Cup, the present regulations are not free of criticism. The cup goes to the National Association to which the winner belongs It would appear fairer to establish a real team classification, by providing for example that the three first pilots from each National team count for the Challenge Cup, in this case, a limited number of pilots should be officially nominated by each National Association before closing of entries, as is the case in many other sporting competitions Incidentally, the result this year would have been First, Geemany 1, 3, 4 8 points, second, Italy 5, 8, 9. 22 points, third, France 2, 10, 22 34 points

Summing up, the first "Challenge International de Tourisme" was the biggest and one of the most interesting aviation competitions ever witnessed in Europe, it proved conclusively the stamina of modern light planes and engines Many fruitful lessons were learned from it by designers and its future appears very promising

The experience gained this year will enable an improved set of rules to be drawn for next contest. One must express the wish that the entry list be of an even more international character, some European countries were not represented adequately this year and the fact is to be regretted

Still more, no representative of America was present It is to be hoped that next year some models of American light planes will enter a competition which could then boast of being disputed by the best light planes of all the countries of the world!

GENERAL NEWS

Introduce Aero Loan Bill in House

Other Aviation Drafts Presented by C J. McLeod

WASHINGTON (D C.) — Providing for the encouragement of commercial aviation to the extent of a government loan fund of $100 000 000 a bill introduced into the House of Representatives by Clarence J McLeod of Michigan, has been referred to the Committee on Interstate and Foreign Commerce

Inasmuch as this Committee has a crowded docket, with such pressing matters as the interstate bus bill to consider and the likelihood of a consideration of railroad consolidation, it is not probable that Mr McLeod's bill will receive attention for some time to come The bill itself is one of such significance to aviation and to the transportation industry in general, that a thorough study of it by the committee is indicated, which will serve further to delay its appearance on the floor of the House

Provision is made in the bill for the establishment of a loan fund not to exceed $100,000,000 the use of which is to be extended to individuals or corporations engaged in aerial transport, at a rate of 3 per cent The loan is to be secured by liens on aircraft hangars and "other necessary facilities to the success of commercial aviation," and is to be repaid in full at the end of seven years

Terms Are Outlined

Fifty per cent of the loan is due at the end of five years. Mr McLeod further provides that loans can not constitute more than two-thirds of the value of aircraft built or to be built, or hangars, or other necessary facilities

Administration of the loan fund as set forth by McLeod, would be handled by the Department of Commerce or a board selected by the Secretary of Commerce of members, at least 75 per cent of whom, "shall be trained and qualified in the operation of aircraft"

One of the most important clauses of the bill is that requiring all aircraft hangars, and facilities of individuals or corporations receiving loans, to be placed at the disposal of the President of the United States in time of national emergency

The point has been made in official quarters that this sum might be expended to more advantage by increasing the Post Office air mail facilities, which would result in the stimulation and support of commercial aviation while rendering a more complete service to the public, and developing a trained personnel for national defense It has also been suggested that, owing to the "rapid deterioration" of aircraft and equipment, the government's money would not be sufficiently protected

Two other bills were presented by Mr McLeod at the same time One provides for the establishment of a department of aeronautics which would take over the work now done by the Aeronautics Branch under the Assistant Secretary of Commerce The new division would be headed by a secretary ranking with other cabinet members and he would appoint a director of aeronautics

As set forth in the document this new department would be created to "foster, promote, regulate, and develop the science of aeronautics, and the adaption of flying, both of heavier-than air and lighter-than-air craft to commercial purposes"

The third bill concerns a standing House committee on aeronautics which would pass upon all proposed legislation relating to civil and military aeronautics This group would be composed of seventeen members

To Use Army Craft In Highway Project

SOUTH BEND (WASH)— United States Army planes from Pearson Field, Vancouver, will be used in finding the most feasible route for the relocation of the Ocean Beach Highway, between South Bend and the Lalix River The rough and heavily timbered terrain that the new road will traverse makes the survey particularly adaptable to the use of planes

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Firestone Ford on Tour

AKRON (OHIO)—Piloted by William M McConnell and Edward J Quigley and carrying four passengers the Firestone tri engined Ford plane took off from the municipal airport on Dec 9 Those participating in the three-month tour of the West Coast cities and the South are M M Mell, vice president of the chamber of commerce B E Fulton airport manager E J Bassiue of the Firestone Battery Co and Robert H Rockwell secretary and treasurer of the Summit Community Newspaper Inc The party will reach Miami Fla Jan 10 at which time the Miami Aviation Meet is to open

Florida State Aero Association Formed

TALLAHASSEE (FLA) — Organization of the Florida State Aeronautical Association was effected here at a meeting of aviation officials and enthusiasts held at the call of Governor Carlton to discuss ways and means of developing the aviation industry in the state R Wallace Davis of Tampa was elected president and Bob C. Smalley St Petersburg secretary The first meeting of the association will be held at Miami on Jan 13, with the opening of The All-American Air Meet Governor Carlton was named honorary president and the following executive committee was appointed Adm A W Marshall, head of the United States Naval Air school at Pensacola, C E Nilson, Orlando, Dr Ralph Green Jacksonville C L Waller, Tallahassee Frank Booth Clearwater and J E Yonge, Miami

The executive committee was delegated to conclude arrangements for the Miami meeting, and to form a basis of representation at the meeting create stimulation of interest, elect delegates to the gathering and to make ready a constitution and by-laws

The organization will have temporary headquarters at Tallahassee It has as its purpose not only development of aviation but also the linking of beanches of that industry into a single unit to further the business of flying and to establish Florida as the air gateway to South and Central America

The society has pledged itself to work for the establishment of emergency landing fields in the state and preparation of certain measures for the next legislature designed to develop the industry also will be taken up at the future meetings

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Delivering Several Sikorskys

BRIDGEPORT (CONN) — Sikorsky officials announce delivery of the sixth amphibion to the New York Rio & Buenos Aires Line which will be put in service on the Miami-Havana leg of the international airway An amphibion has also been received by Grigsby Grunow Co makers of Majestic Radios, for the use of its executives The third Sikorsky amphibion for the Inter-Island Airways, Honolulu, H I, is being crated for delivery to that company.

Plan Smaller Ryan Plane

ST LOUIS (MO)—A "baby sister to the 'Spirit of St Louis'" will be in production here shortly after the first of the year a Ryan Aircraft Corp announcement states

Ryan Aircraft Plans Extensive Sales System

ST LOUIS (MO)—According to a new policy announced by the Ryan Aircraft Corp division of D.A.C., Ryan planes will be on sale and exhibition in all cities of the country of 10,000 population or better In granting the agencies, preference will be given to organizations capable of giving service on the planes, and those that will employ full-time airplane salesmen, said John Nulsen, Ryan general manager

In general, we plan to duplicate the methods which have been employed so successfully in popularizing the automobile," Nulsen stated "Every individual having an income of $25 000 or over and all corporations doing business over a wide territory, are potential prospects for some type of airplane, and we plan to see that every one of these persons and organizations is approached by competent sales representatives in the next six months

Plan Many Additions to Staff

In the larger cities, the sales agencies will keep a demonstrator always available, together with one or more ships for immediate delivery In the smaller towns, a factory demonstrator will be placed on exhibition periodically, and made available to the local dealer for demonstrations All these agencies will be authorized to sell planes on the time payment plan, and will provide hangar facilities and service arrangements The plan calls for the immediate appointment of 100 airplane salesmen and later additions to this staff"

Nulsen said that this plan had been made feasible because for the first time since Lindbergh's flight, the company is able to make reasonably prompt delivery on planes, and because of the production of new models and the close connection with Detroit Aircraft Corp, it makes necessary a nation-wide sales staff

"Selling airplanes today requires methods not far different from those used in merchandising other products, and we believe that such a sales organization will make larger production possible so that suitable airplanes may eventually be offered to purchasers at somewhat lower prices," Mr Nulsen said in conclusion

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Air Heads Express Opinions to President

WASHINGTON (D C)—Col Paul Henderson, president of National Air Transport and Transcontinental Air Transport, and C M Keys, president of Curtiss Airplane & Motor Co recently gave President Hoover their views on the aviation industry situation and outlook Col Henderson declared the air mail business was good, passenger transport activities only fair, production of military and naval planes was "reasonably" good, and that the commercial manufacture of planes for air passenger service, was fair

In his statement, Mr Keys declared the industry was suffering a seasonal slump, but would pickup in the spring and is in a generally sound condition It is being well financed he said and in the course of time, will be able to take care of itself Other aeronautical leaders who recently conferred in Washington included William B Mayo Edward S Evans and Frederick B Rentschler

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U. S. Planes in Mexican Show

WICHITA (KAN)—Travel Air and Cessna exhibited planes at the National Aeronautics Exposition at Mexico City, Dec 10 to 16 Truman Wadlow, pilot, and R Lee Walls salesman, flew a new six-place Travel Air monoplane from Wichita to Mexico City Stanley Stanton, pilot, with Hugo Kenyon vice president and Jim Verts, purchasing agent, flew a four-place Cessna monoplane to the exposition.

Irving West Coast Plant Nearly Ready

THE NEW FACTORY of the Irving Air Chute Co. at Grand Central Air Terminal Glendale, Calif, will be in operation before Jan 1 as the general engineering base for the manufacture and testing of Irvin Air Chutes and accessories The plant will employ about 50 experts under the management of Guy Ball Bert White is Western sales manager

HIGH POINTS in the NEWS

✦ Aid asked for operators McLeod introduces bill in House asking aero loan fund not to exceed $100,000,000 for use of individuals or corporations engaged in air transport Referred to Committee on Interstate and Foreign Commerce

✦ And greater governmental importance too McLeod also asks establishment of a Department of Aeronautics headed by a cabinet member

✦ Insurance risks classified Barber & Baldwin drafts code for guidance of underwriters in gathering aviation insurance statistics

✦ Another engineless advance Bowlus sets new glider record of 2 hr 47 min 13½ sec as best effort of American pilots, American planes

✦ Successful display terminates. Baltimore's first exposition closes, having been viewed by some forty thousand persons

✦ More airmen flying seconds. Ruckstell Corporation of Los Angeles reports sales of used planes exceeding $350,000 in value since July 1

✦ All engine duty should be standard. So believes James Young, president of Canadian Pratt & Whitney, who asks Tariff Advisory Board for more reduction in import duty on aero articles already imported into the U. S from some foreign country

✦ Accommodations for many St Louis show will provide space for 250 planes Fifty-six exhibitors already signed.

✦ And now a touring-demonstrating firm. Curtiss Wright Exhibition Co will be formed to visit airports display planes

Airports and Airlines

✦ Extensive mail service for Southwest. Three new lines planned Los Angeles-Dallas and Fort Worth-Birmingham, Dallas and Fort Worth-Louisville, New Orleans-San Antonio-to point on line between El Paso and Fort Worth And a fourth new line New York-St Louis

✦ A drop—but there were two less business days Air mail figure for November is 623 161 lb, 78 468 lb less than October

Foreign

✦ Paris reached more cheaply Imperial Airways announces $17 London-Paris fare on 8 a m plane $23 for de luxe service at noon.

✦ A forced-landing crash? Well, the maker will repair it gratis—that is, if the maker is DeHaviland and if the engine is a Gipsy Offer good for year after delivery

Baltimore Show Viewed by 40,000

Layout of Exposition Especially Attractive

BALTIMORE (MD.)—Having attracted more than 40,000 persons, the First Annual Baltimore Aircraft Show, held at the Fifth Regiment Armory, came to an end Saturday evening Dec 14 Ray Krimm, show director, pronounced the exposition, which had attracted twenty planes, a success and said that a display would be scheduled each year.

The layout of the Baltimore show was outstanding in attractiveness The high-vaulted ceiling, which was completely covered with bright blue, orange, and pink draperies, gave an impression of spaciousness which was pleasing to those who had experienced low-ceilinged and crowded shows. Seventy soft lights bearing airplane silhouetted coverings hung from above to illuminate the various displays.

Ray Krimm

Music Added Much

Managers of future shows might well follow the example set at Baltimore in providing adequate musical entertainment for visitors An exceptionally good band directed by Bob Iula played during the evenings and was audible in all parts of the hall because of its central location Radio music was brought in at times when Iula's men were not in action.

It is noteworthy that several of the craft exhibited represented firms engaged in business other than aeronautical, indicating a trend toward the use of planes in business The Curtiss Robin planes of the American Insulator and Atwater-Kent organizations were on display as well as the Travel Air monoplane operated by Black and Decker

Travel Air "S," B/J Shown

Two airplanes, the Travel Air low-wing monoplane and the Berliner-Joyce Cabin monoplane, were exhibited for the first time at any aircraft show and one, the Savoia Marchetti S-56, was displayed for the first time in the East. The Travel Air plane will be remembered for its excellent performance at the Cleveland Air Races with Doug Davis at the stick, while the B/J is the first product of the Berliner-Joyce company and embodies an attempt to gain increased visibility in cabin monoplanes by setting the wing at the level of the pilot's eye so that it is possible to look above or below it The Savoia Marchetti is a three-place biplane amphibion now in production by the American Aeronautical Corp A Wright company engine is used in the Travel Air plane and Kinner power plants are employed in the B/J and S-56 craft.

The latest version of the Verville Air Coach, especially built for the du Pont interests, also was shown and attracted attention because of its characteristic streamlining and also its finish, a recent development of the du Pont company

Among the other airplanes shown were a Travel Air biplane, Cessna monoplane, Fairchild Kreider Reisner planes with OX-5, Challenger, and J-6 engines, an American Cirrus and a Gipsy Moth, one of which had a detachable enclosure for the tandem cockpits, a Bellanca "Pacemaker" and Doyle O 2, and a J6-5 Robin operated by The Texas Company Raffle tickets at $.50 were being sold for a Monoprep plane by the Pilots and Mechanics Club of Logan Field A Curtiss Falcon and Consolidated O-17 of the Maryland National Guard unit lent a military note.

They Started on Harleys

Among the many booth exhibits were several which represented products not pertinent to the aircraft industry, but these were not felt to be so numerous as to detract from the tone of the show A motorcycle display brought smiles from several airmen It read "Lindbergh Chamberlin, Goebel, all started on Harley Davidson motorcycles"

Following is a list of additional exhibitors

Park Heights Flying School, Baltimore; Bearnt & Fuller Co. Cleveland; Aluminum Company of America, Pittsburgh; Baltimore Airport Inc., Baltimore; International Correspondence Schools, Scranton Pa.; Robert J Stewart Baltimore; Yellow Cab Co., Baltimore; Fleischmann Transportation Co. Baltimore; The Schofield Silver Co, Baltimore; Norman, Remington Co., Baltimore; Emerson Drug Co, Baltimore; *Aero Mechanics*, New York N Y; Baltimore & Ohio Railroad, Baltimore; Standard Oil Co., of New Jersey, Baltimore; Maryland Casualty Co, Baltimore; The Chesapeake & Potomac Telephone Co., Baltimore; Consolidated Instrument Co. of America, New York, N Y; Mauty Donnelly Williams & Parr, Baltimore; Horwen Products Co, New York N Y; Consolidated Gas Electric Light & Power Co., Baltimore; Allan Tractor Co. Inc, Baltimore; Pitcairn Aviation, Inc, Logan Field, Baltimore; Sherwood Bros Inc Baltimore; Curtiss Wright Flying Service Inc., Baltimore; Black & Decker Manufacturing Co, Baltimore; Automobile Club of Maryland, Baltimore; General Supply & Equipment Co, Baltimore; J D Wallace & Co Baltimore; Parks & Hull Inc Baltimore; Heinz Motor Co. Baltimore; American Oil Co, Baltimore; Commercial Radio Institute, Baltimore; The American Propeller Co, (Paragon), Baltimore; Baltimore School of Aeronautics, Baltimore; The Texas Co, Baltimore; Kroeger Advertising Co., Baltimore; Pennsylvania Railroad Baltimore; The Hughes Co., (J W Scott), Baltimore; Julian P Friez & Sons, Baltimore; United States Fidelity & Guaranty Co, Baltimore; Liggett & Myers Baltimore; William H. Cole & Sons Baltimore; Ilsinger, Inc., Baltimore; Aero Supply Manufacturing Co., College Point L I; Mayflower Cab Co., Baltimore; Davidson Transfer & Storage Co, Baltimore; Graybar Electric Co, Baltimore.

Move Gliders, Inc., to Detroit

ST LOUIS (MO)—The factory of Gliders, Inc., acquired by Detroit Aircraft Corp., will be moved from Orion, Mich to the aircraft corporation's Plant No 4 at Detroit

Cleveland Court Hears Swetland vs. Curtiss Case

CLEVELAND (OHIO)—The case of Swetland vs Curtiss Airports Corp, et al, which was tried before Judge George P. Hahn Dec 10-13 in Cleveland is considered of far reaching importance to the aviation industry Four cases of similar nature—injunctions seeking to restrain the operation of airports—have been dismissed by state courts, but this is the first to come before a federal court Whatever decision is rendered, will have great influence on the court in future trials

Briefs are to be filed by plaintiff defendant, and Elmer McD Kintz chief of the legal section of the Department of Commerce, about the first of the year. Mr. Kintz attended the hearing in the capacity of Amicus Curiae (friend of the court) and will assist the court in his brief on the points of law involved Howard F Rugh, assistant chief of the inspection section, Aeronautics Branch, Department of Commerce, also attended

Swetland charged that planes taking off and alighting on Curtiss Field passed over his property thus committing a trespass and nuisance He further alleged that the noise of these operations was such that conversation could not be carried on on his front porch. Curtiss countered the charges by declaring that according to Sec 10 of the Air Commerce Act of 1926 which allows freedom of flight above the minimum height prescribed by the Secretary of Commerce, it had committed no trespass

Judge Watches Test Flights

They admitted that a certain amount of noise was necessarily involved in the operation of the field, but declared that in point of fact there was no nuisance They also stated that much of the dust complained of by the defendant was caused by tractors employed in grading the field, which is to be sodded and provided with hard surface runways, thus obviating this annoyance Judge Hahn was taken out to the field and to Swetland's adjoining property to look over the situation the first day of the trial Two flights were made around Swetland's house for the observation of the judicial party This course was taken with the consent of both parties in the case

Le Blond Base at Van Nuys

VAN NUYS (CALIF.)—Permanent distribution and service headquarters for LeBlond Aircraft engines have been established in the hangar of the Angelus Aero Corp, located at the Los Angeles Metropolitan Airport, according to a recent announcement made by C. C Ludlow, Pacific Coast distributor for the LeBlond Aircraft Motor Corp Mr Ludlow stated that a complete line of parts, supplemented by mechanical service and testing facilities, will be maintained by the Angelus Aero Corp, thereby providing efficient and convenient service to Southern California owners of LeBlond engines

Canadian P & W Seeks Change in Import Duties

OTTAWA (CAN)—In a recent appeal made to the Tariff Advisory Board J. A D. McCurdy, and James Young, president of the Canadian Pratt & Whitney Co, asked for an increase on the drawback which is a reduction in import duty given for articles already imported into the United States from some foreign country

Mr Young stated that all airplane engines should be subject to one set of duties namely, 15 per cent British preference 25 per cent intermediate and 27½ per cent general tariff He pointed out that after July 1, 1930, a drawback of 50 per cent would be granted by the Dominion government on materials or parts imported for construction of airplanes provided 40 per cent of the production cost was incurred in the Dominion

Those engaged in this industry, he said, felt that the content requirement could not be complied with for at least two years He urged that drawbacks be 99 per cent on the British preferential, 80 per cent on the intermediate and 75 per cent on the general tariff and stated that he was not in favor of the content requirement being applied until the industry was able to comply with one of a considerable percentage

Technical Committee Of U.A.T. in Conference

SEATTLE (WASH)—With engineers and technical experts from various parts of the country in attendance, the technical advisory committee of United Aircraft & Transport Corp has been holding sessions at offices of the Boeing Airplane Co in this city, which with other Boeing companies is a subsidiary of United. W E Boeing is chairman of the board of directors and F B Rentschler, president

During the sessions which continued for several days, technical details of design and construction were discussed, but not made public United subsidiaries include airplane and engine manufacturing, commercial air transport operations airports, flying schools, and export activities.

The conference was presided over by George J Mead of Hartford Conn, chairman of the technical advisory committee, vice-president of Pratt & Whitney, and a director of United

Ten Conquerors for U.S.S.R.

NEW YORK (N Y) — Through the Amtorg Trading Corp here ten Curtiss Conqueror engines have been ordered for shipment to the U S S R early in 1930 According to John S Allard vice-president and general manager of the Curtiss Airplane & Motor Co, the engines with spare parts, will represent more than $100,000

Naval Squadron Which Won Herbert Schiff Trophy

WASHINGTON (D C)—President Hoover on Dec 14, presented the Herbert Schiff Trophy to Lieut Thomas Geary Fisher on behalf of Training Squadron Seven of the Naval Air Station at San Diego, Calif, which he commands Formerly given to the Naval aviator who had flown the greatest number of hours during the year without an accident, a change in the awarding of the trophy has been made, whereby it will be won by the squadron or unit making the best safety record during the year

Training Squadron Seven led the Navy with a score of 1 164, this being figured out on a handicap basis with the number of accidents and their seriousness counted in The squadron flew a total of 8 159 35 hr with a handicap of 1 10 (The handicap is figured out according to units where the hazards are greatest a fighting squadron, for instance being rated 1 0, as its flying is probably the most dangerous in type)

Approximately 571,130 mi were flown during the fiscal year 1929 by the Seventh Squadron, 478 "green" students were trained and of that number, 157 were qualified for further training Six officers and eight enlisted men comprised the personnel of instructors Only three minor accidents were incurred by the unit and none of these resulted in personal injury

Capt Frank McCrary, U S Navy, commanded the entire Naval Air Station and Lieut Comdr William Masek, flight officer, and Lieut Fisher squadron commander, had charge of the Seventh unit, one of whose members was Lieut James E. Dyer who won the Schiff award in 1928 with a total of 1251.25 hr to his credit.

Dominion Firm Adds Branch

WINNIPEG (CAN) — Aeronautical Corporation of Canada with head office here has opened a branch office in Montreal The office is busy filling ski orders

Langley Medal to Byrd and Manly

WASHINGTON (D C.) — Comdr Richard E Byrd has been chosen to receive the Langley medal for aerodromics by the Smithsonian Institution and has been notified of the honor through a special radio message sent to Little America At the annual meeting of the board of regents, presided over by Chancellor William Howard Taft, the late Charles Matthews Manly was also designated for a posthumous grant of the same award for his pioneer work in aircraft engine development. Others who have received the Langley medal are Lindbergh, Wilbur and Orville Wright, Glenn H Curtiss and Gustave Eiffel, Eiffel Tower builder.

Hear Repair Station Inspection Problems

WASHINGTON (D C)—During a four day conference recently completed here, plans were made for the inspection of aircraft repair stations by engineering inspectors of the Aeronautics Branch and other officials according to J S Marriott chief of the inspection service of the Branch

A meeting with manufacturers to discuss certain changes suggested will have to take place before the rules can be put into effect and will probably be held sometime in the spring Prior to this, there will be another gathering of the engineering inspectors to further formulate plans for regulations.

If repair stations co-operate with the manufacturer in getting data which would permit repairs to be based on original specifications, it will not be necessary for the station to send stress analyses and other information on the work to be done to the Department for approval.

St. Louis Entries Number 56 to Date

Arena to Provide Space for Exhibition of 250 Craft

ST LOUIS (MO)—Entry space for the exhibition of 250 aircraft will be provided for at the St. Louis arena for the International Aircraft Exposition, Feb 15 23, being sponsored by the Aeronautical Chamber of Commerce. A corps of workers under direction of Clifford W Henderson are planning a show which will draw exhibits from most of the major manufacturing and operating companies in the aircraft industry in this country and perhaps several from abroad.

This will be the first international affair of its kind to be put on under direction of the Aeronautical Chamber of Commerce since the 1928 exhibit held in Chicago in conjunction with the International Civil Aeronautics Conference called by President Coolidge to mark the 25th anniversary of the first flight The St. Louis exposition will be the only class A show to be sponsored or sanctioned by the Chamber during 1930, according to Charles L. Lawrance.

Plan Transportation Pageant

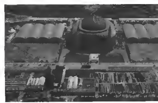
Many exhibits of accessories and equipment will be housed in the two large wings of the building, while air transport companies will portray the progress made in their line and the latest comfort, luxury and safety available. A feature of the show will be a pageant depicting the evolution of transportation from the earliest times to the present century This will be staged in the central building of the Arena

The members of the Chamber show committee are Charles L. Lawrance, vice-president of the Curtiss-Wright Corp, chairman; C J Brukner, Waco Aircraft Co ; C V Cessna, Cessna Aircraft Co.; C. H. Colvin, Pioneer Instrument Co ; T Z Fagan, Scintilla Magneto Co.; E. N Gott, Keystone Aircraft Corp ; H M Hanshue, Western Air Express; P. G Johnson, Boeing Airplane Co ; H C Lippiatt Southern California Travel Air distributor ; H. P. Mammen, Parks Air College W B Mayo, Ford Motor Co , H C Ritchie General Electric Co , F H Russell, Curtiss Aeroplane and Motor Co , A A Woodruff, Fairchild Airplane Co Maj. G A. Vaughn, Jr., Eastern Aeronautical Corp , and Maj. P G. Kemp, Central Air Terminals

Firms which Have Entered

As of Dec 11, 56 exhibitors have reserved space in the show The list is as follows:

Air Transportation, Inc., Publishers, New York, N Y , Aluminum Co of America, Pittsburgh Penna. Bendix Aviation Group Berry Brothers, Detroit, Mich , Brownback Motor Laboratories, Inc. New York, N. Y , Champion Spark Plug Co. Toledo, Ohio , Comet Engine Corp , New York, N Y ; Continental Aircraft Engine Co , Detroit, Mich Crescent Tool and Mfg Co., St. Louis, Mo. , Crouse Hinds Co , Syracuse, N Y Curtiss Wright Sales Corp., New York, N Y Dare Airplane Co , Detroit, Mich., Davis Aircraft Corp., Richmond, Ind Dayton Airplane Engine Co , Dayton, Ohio Detroit Aircraft Corp , Detroit, Mich Eda Aircraft Corp., L. I., N Y Endicott Forging & Mfg Co Endicott, N Y , Fafnir Bearing Co., New Britain Conn Fokker Aircraft Corp., New York N Y Herwen Products New York, Haskelite Mfg Corp. Chicago Ill , Hill Auto Body Metal Works, Cincinnati, Ohio Imperial Brass Mfg Co Chicago Ill., Independent Oil & Gas Co., Tulsa, Okla. Indianapolis Tool & Mfg Co., Indianapolis, Ind International Flare Signal Co Tippecanoe City, Ohio Irving Air Chute Co. Buffalo, N Y Johnson Airplane & Supply Co, Dayton Ohio, Kendall Refining Co., Bradford Penna. Kinner Airplane & Motor Corp., Glendale, Calif , Lycoming Mfg Co , Williamsport, Penna. Macwhyte Co., Kenosha, Wis Nicholas-Beazley Airplane Co , Marshall Mo Pitcairn Aircraft Inc , Bryn Athyn, Penna., Pyle-National Co , Chicago Ill Richfield Oil Co , New York, N Y H H Robertson Co Pittsburgh, Penna., John A Roebling s Sons Co Trenton, N J , Rome Wire Co, St. Louis, Mo B Russell Shaw Co. Inc., St. Louis, Mo St Louis Aircraft Corp., St. Louis, Mo Simmons-Boardman Publishing Co , New York, N Y Sinclair Refining Co., New York, N Y Sky Specialties Corp., Detroit, Mich Splitdorf Electrical Co., Newark, N J Standard Oil Co , Chicago, Ill Supreme Propeller Co, Wichita, Kans Tubular Rivet & Stud Co Boston Mass., United Aircraft & Transport Corp New York, N Y , Universal Aviation Corp , Angum, Mo , Vacuum Oil Co, New York, N Y Waco Aircraft Co , Troy, Ohio Western Electric Co New York, N Y , Westinghouse Electric Mfg Co Pittsburgh, Wright Aeronautical Corp Paterson, N J , Wyman Gordon Co , Worcester, Mass



The St. Louis Arena, Scene of the Coming Class A Exposition

Make Plans to Form Curtiss Exhibition Co.

NEW YORK (N Y)—An official announcement states that a firm to be known as the Curtiss-Wright Exhibition Co , will be formed early this coming year According to Maj E H Brainard, vice-president in charge of operations for the Curtiss-Wright Flying Service, who will be president of the new concern the Exhibition company will specialize in the demonstration of airplanes designed, manufactured, and sold by the companies making up the Curtiss-Wright Corp

"While our plans are still in the process of being formulated," said Major Brainard, 'the purpose of the Curtiss-Wright Exhibition Co. will be to demonstrate modern airplanes to the widest possible audience. To accomplish this, we intend to assemble a team of experienced pilots who will tour the airports of the country, at each of which they will give exhibitions. Their planes will represent the most recent and interesting types developed"

The officers of the new company, in addition to Major Brainard as president, will be David Visel, vice-president H. D. Norris, vice-president and general manager and N A Nelson, secretary-treasurer. The directors will be William F Carey, chairman of the board, Major Brainard, J. A. B. Smith, C. S Jones, Chester W. Cuthell, David Visel, R W Schroeder and W. H. Pickens, who will act as show manager.

Mr Norris, formerly an officer of the U S. Army Air Corps, is at present in Chicago, conferring with Major Schroeder upon the details connected with organizing the field equipment and personnel of the company. Upon his return, it is expected that it will be possible to make public full details of the company's plans

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Additional Planes Approved

WASHINGTON (D. C)—Three more planes have been issued approved-type certificates. According to certificate number, make and designation, type, power plant, weight empty, useful load, and gross weight, they are: No 277—St Louis C-2-110, two-place closed monoplane, Kinner 90 hp , 1,002 lb , 532 lb , 1,525 lb , No 278—Travel Air 10 D, four place closed monoplane Wright J6-7, 2,130 lb , 1,270 lb , 3 400 lb , No 279—Lincoln PT Kinner, two-place open biplane, Kinner 90 hp , 1,176 lb , 591 lb , 1,769 lb

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Magazine Makes Design Award

NEW YORK (N. Y.)—James P Rigby, a U S Army private, stationed at Luke Field, Hawaii, has been declared first prize winner of the *Scientific American* contest for designs of a light airplane for private fliers He will receive $500 and a gold medal Col R Potter Campbell, president of American Cirrus Engines, Inc , provided the cash awards and medals for the contest

American Aid Sought By Brazil Air Interests

WASHINGTON (D C.)—Mario Bastos, a young Brazilian representing Henrique Lage, prominent ship owner of Rio de Janeiro, has come to the United States to obtain from aircraft manufacturers in this country financial and technical assistance for establishing the aviation industry in the South American republic. Lage owns an island in the Rio harbor regarded as adaptable for use as an airport on which he plans to erect a manufacturing plant for the production of aircraft for the Brazilian army and navy It is reported that he has imported $300,000 in machinery and equipment. Lage has no contract with the Brazilian government, but it is assumed that the government will favor national industry in making its purchases of aircraft. The budget now before the Brazilian Congress contemplates an initial expenditure of approximately $750 000, to be used for aeronautical development, including construction of airports and the purchase of aircraft.

The production of airplanes in Brazil is very small and to date the country has offered only a small market to manufacturers in other countries Several foreign airlines are now in operation, but public sentiment seems to favor identification of the domestic industry with the United States rather than foreign interests It is for that reason that Mr Bastos has come to this country rather than France or Germany

Lage's plans still are tentative and probably will be shaped largely by the outcome of the mission of Mr Bastos to the United States It is believed that his manufacturing operations will be confined to planes and that engines will be imported The amount of capital that Lage desires to raise in this country is not known Technical assistance also is required and for that reason Mr Bastos is endeavoring to enlist the services of expert technicians as well as investors

Exports of aircraft from the United States to Brazil during the first six months of the current year consisted of one airplane valued at $40,000 and parts valued at $5 073 Last year exports consisted of five airplanes valued at $66,340 with eight engines valued at $6,200 and parts valued at $40,686.

Fabric Firms Consolidate

NEW YORK (N Y)—Dec 10th saw the consolidation of E S Twining & Co with Wellington, Sears & Co , representative of an extensive group of textile mills in this country and manufacturers of fabrics for the aircraft and mechanical trades The Twining firm will continue production of Flightex plane fabrics and sale of the same through its dealer organization which includes Air Associates, Inc Johnson Airplane and Supply Co , Nicholas-Beazley Airplane Co , Inc , Pacific Aeromotive Corp and Southern Aeromotive Service, Inc

Two Left in Safe Plane Contest

MITCHEL FIELD (L. I., N. Y.)—Following the withdrawal of the Ford-Leigh plane, but two craft, the Handley Page and Curtiss Tanager, remain in the Guggenheim Safe Aircraft Competition under way here Re-entry of the repaired low-wing plane of J S McDonnell, Jr, & Associates may still bring the number to three, provided the re-entry can be effected by Dec 23 and also provided the contest has not closed at that time This craft would be eligible for one of the $10 000 prizes though not for the grand award of $100,000

Switlik Announces Sales of Parachutes

BALTIMORE (MD)—H J Wolcher, salesmanager of the Switlik Manufacturing Co parachute division, Trenton, N J , announced during the show that the concern has recently taken orders for sixteen of the Floyd Smith chutes, with eleven going to the Air Transport Equipment Co , Roosevelt Field, L. I., N Y., and five to the William Penn Airport concern at Philadelphia The firm, he said, is in full production with approximately twenty-five men at work in the division

Three demonstrators are now working in the field, Mr Wolcher stated These men are J J Dunkel, now on the West Coast, "Doc" Taylor, who has been touring New England and is about to enter Canada, and William Frisch, who has been with the Switlik display at the air exposition here and who will now head south on further demonstration work

Mr Wolcher plans shortly to leave for the western states and Coast He will appoint dealers and distributors

Used Plane Sales Increase

LOS ANGELES (CALIF)—Sales for the past six months on used airplanes by the Ruckstell Corporation have increased more than 100 per cent, according to Ed L Erickson, general manager Since July 1 Mr. Erickson states used planes valued in excess of $350,000 have been bought and sold through his organization Mr Erickson is said to be the pioneer of the used airplane business in Southern California In addition to buying and selling used planes, the Ruckstell Corporation is Southern California distributor for the Great Lakes Trainer

Bureau Tests Reed Indicator

WASHINGTON (D C)—Following tests at the Bureau of Standards, it has been found that the vibrating reed indicator, heretofore placed on instrument boards at least 18 in from the magnetic compass, can be located within 3 in of it without effecting the compass However steel must not be used for the external mounting of the indicator, it is pointed out

Moffett Praises 5-Year Program

Annual Report Summary Outlines Gains and Needs

WASHINGTON (D C)—The annual report of the Chief of the Bureau of Aeronautics Navy Department, Rear-Adm W A Moffett, released on Dec 9, contains eleven conclusions and recommendations Briefly, they are listed herewith:

1. The "wisdom and soundness of the 5-year program" has been demonstrated with the developments that took place during the past fiscal year and it is believed necessary to bring the plans to completion without material changes. More planes will have to be constructed so that the new airplane carrier which the last Congress authorized, will not draw upon craft in other branches of the Navy

2. Though the Navy has on hand at present five principal types of planes, namely fighting, observation, torpedo and bombing, scouting, and training craft, it is important that larger appropriations be made for work along experimental lines so the Navy does not fall behind in the various types of fighting aircraft

Airship Program Well Defined

3. Airship plans for the next two or three years are said to be fairly well defined as the two Navy rigid airships are underway and a program has been outlined for the establishment of a new airship base

4. It is claimed that the "development of our flying fields has not kept pace with the rapid increase in flying activities" New and additional quarters and hangars are needed to supplant those of war-time construction Money for these improvements should be furnished

5. More objections are being raised concerning the joint occupancy by the Army and Navy of North Island and Ford Island due to congestion of operations, and there is a desire to turn both of these bases into naval air stations It is understood that Ford Island will be vacated by the Army on completion of its base in Hawaii, and it is hoped that the Army will soon find another place to move to from North Island, San Diego, which is considered both logically and in fact to be the most important fleet air station.

Men Still Scarce

6. By increasing the number of officers and enlisted men assigned to the Pensacola Naval Air Station, some progress has been made in reducing the shortage of qualified aviation personnel but the scarcity of men "still remains and constitutes one of the most serious problems facing naval aviation The large present demand from commercial organizations for Navy-trained pilots and technicians adds seriously to the attrition and difficulty of securing adequate numbers This particular diffi-

(Concluded on Page 1230)

Underwriters Work Out Code

Barber & Baldwin Issues Guide for Insurance Risks

NEW YORK (N Y)—In collaboration with the L B Recording Statistical Corp and Aero Engineering and Advisory Service, Inc, Barber & Baldwin aviation insurance underwriters, has has prepared a classification coding system for use in conjunction with tabulating machines, for gathering aviation statistics for the guidance of underwriters

Insurance for aviation risks has had to depend largely upon the highly developed personal judgment of the underwriter in connection with each risk offered. Properly classified experience data has been lacking in the past and this new classification system is a decided step forward in meeting a need which becomes more pressing as the volume of aviation insurance increases

The manner in which this subject has been handled is indicated by the following summary of the B & B Classification Coding System The entire business is first subdivided as formerly according to major coverages, embodying fire accidental damage tornado, theft, public liability, passenger liability, property damage, personal accident, compensation, etc

Follows N A C.A Method

Each major coverage is then classified under seven separate codes, viz, type of aircraft in combination with number of engines, age, use, ownership, manufacturer, list price, geographical limits The present plan provides for eight types of aircraft, sixteen different uses and four classes of ownership, but its flexibility will permit of such further refinements as future developments may warrant

The classification of loss code indicates the character of claims presented and the common causes in which most of them may be grouped The Barber & Baldwin plan of classifying losses, follows closely the method of analysis recommended by the National Advisory Committee for Aeronautics All losses are first segregated according to the nature of the accident with respect to the policy coverage, the more important groupings being as follows

FIRE	Resulting from a crash Self-ignition on ground Self-ignition in flight From external causes (in hangar or shop) From external causes (out in open)
LIGHTNING	
TRANSPORTATION	
ACCIDENTAL DAMAGE	Take-off accidents Landing accidents on airports Landing accidents forced landings While moored Other than foregoing
WINDSTORM OR TORNADO	
THEFT	
PILFERAGE	
DAMAGE TO GROUND PROPERTY	
LIABILITY	Public Passenger Property damage Workmen's Compensation
PERSONAL ACCIDENT	

The cause of each accident is classified under three major headings subdivided as follows

PERSONNEL	Errors of Pilot Errors of Supervisory Personnel Errors of other Personnel
MATERIAL	Power plant failure Structural failure Failure of controls Handling qualities Instruments
MISCL	Weather Darkness Airport or terrain Failure of fuel supply Overloading Miscellaneous not otherwise classified

Each loss is further classified according to the experience of pilot involved in the accident.

Barber & Baldwin, Inc, have offered to furnish the other companies writing aviation insurance a copy of their revised plan for the classification of aircraft premiums and losses While the present premium income is insufficient to afford reliable data for rate making purposes, and the judgment of the experienced underwriter with respect to individual risks must continue to prevail for some time to come, it is hoped that eventually the data obtainable under this classification plan will serve as a valuable guide to companies writing this class of business

Test Landing Gear By Dribbling Plane

ST LOUIS (MO)—Eighty-four "bounce" landings were made in two days recently on a new split-type landing gear developed for the Parks P-1 which has recently been named the Parks Courier After five Parks Airport pilots had taken turns "pancaking" the plane the gear was reported undamaged by the rough handling

Tennessee Gets Air Division

NASHVILLE (TENN)—Through the passing of a bill signed by Gov Henry H Horton, which became effective Dec 11, there has been created a division of aeronautics in the Department of Highways. The commissioner of highways is designated head of the new office and will work with an advisory committee of eight members The bill provides for a maximum budget of $50 000 a year and charges the air division with providing emergency landing fields for the state and seeking suitable locations for airports Violation of rules and regulations established by the department shall constitute a misdemeanor and be punishable by a fine not exceeding $100

Moffett Praises 5-Yr. Aviation Program

(Concluded from Page 1229)

culty may in a large part, be remedied by the passage of suitable pay legislation, as recently recommended by the joint departmental board"

7 In the face of this shortage, the department is using a number of non fliers as spotters for battleship planes Trained pilots, accustomed to air observation, are considered to be more valuable in the air than officers detailed to such duty for the time being

8 It is believed to be unduly restrictive that 30 per cent of the pilots must be enlisted men and the Bureau wants the law modified as soon as possible The Army Air Corps rule, which permits flexibility of the law and allows use of about 21 per cent enlisted pilots might be followed

9 During the past year, the necessity and value of the Naval Reserve has been demonstrated. It should be maintained with as large a force as possible for in case of an emergency, there would then be pilots for any large number of craft rapidly built

10 The marked increase in the number of hours flown and safety of operation has been apparent during the past year when pilots averaged 216 hr while there was only one fatal accident for every 11,288 hours of flying With the continued development of new ways and means to make aviation safer and a study of aircraft accidents the decrease in mishaps is expected to continue.

11 Since aircraft carriers have been found to be of great military value the action of Congress in authorizing another plane carrier is commended and it is declared most important that the carrier tonnage allowed under terms of the Washington Limitation of Armament Conference be put under construction soon The General Board has already made plans for this on its schedule and they have been approved by the department

Pittsburgh Show Data Ready

PITTSBURGH (PA)—Display contracts and information blanks are now being distributed by Ray Krimm, director, for the Second Annual Pittsburgh Aircraft Show scheduled for Motor Square Garden, March 6-15, 1930 The exposition is being sponsored by the Aero Club of Pittsburgh All space required for the display of aircraft will be furnished gratis, while booth space will rent for $1 per square foot Communications should be addressed to Ray Krimm, director Pittsburgh Aircraft Show, William Penn Hotel.

Shreveport Service to Wedell

NEW ORLEANS (LA.)—Shreveport Airways Service, Inc has been purchased by Wedell-Williams Air Service, according to reports made public here

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New Firms Announced

WHEELER COPE MOTOR CO, Alliance, Ohio, capital $50 000 by L R Cope Karl Wheeler, John Eyer, Henry E Gilling and J W McCord to deal in airplanes balloons, motor vehicles, radios phonographs and accessories of all kinds

RICELAND FLYING SERVICE INC, Dayton Ohio capital $5 000 by John S Smith, Royal H Poorman, and Cloyd W Smedley

ALL-AMERICA AIRWAYS, INC, Miami, Fla, capital $250,000 in shares of $100 par value, by W W Blount, T C. Blount, and Leila Russell,

COMMERCIAL AIRWAYS, LTD Edmonton Alta, capital 300 000 shares no par value stock, by John Michaels and C Becker.

AIRCRAFT IMPROVEMENT CORP 366 Madison Ave, New York, capital 20-000 shares no par value stock, Lowell H Brown, president to manufacture and deal in aircraft and accessories

SUPER MODEL AIRCRAFT CORP, Brooklyn, N Y, Capital 100 shares no par value stock by Blume F Sturgis, Marguerite Loeffelhardt, Jane E Donsbach, to manufacture aircraft

EAGLE AERO CORP, Baltimore Md. by C. F. Small, C C Hall, and others,

NATIONAL AIRCRAFT PRODUCTS CO, Dayton, Ohio, S J Sorensen, Pres, T M Hiester, Vice-Pres and Gen Mgr, Harry M Hiester, Asst. Gen Mgr, G A Funkhouser, Sec'y, P W Christensen, Treas; to engage in a general line of engineering for airplane work and to manufacture pumps strainers, fuel and gas line fittings

THE SAN FRANCISCO SEAPLANE BASE, LTD, San Francisco, Calif (Nevada incorporation), capital 250,000 shares no par value stock, by George W McNear and others, to engage in a general aviation and amusement business

YOUNGSTOWN AIRPORT CO Youngstown Ohio, by R W Collins Alex Collins James Collins and W W Watson, to operate Watson Field as a private airport conduct a flying school and general flying service.

Air Map in Soil Survey

WASHINGTON (D. C)—Jennings County, Ind, was recently photographed in its entirety from the air to secure preliminary data to be used in making a base map for a county soil survey This was made known through Dr A. G McCall, chief of soil investigations, Bureau of Chemistry and Soils, U S Department of Agriculture, and is said to have been the first time that an entire county has been mapped from the air for soil survey purposes Using a scale of 4 in to the mile, the photographing was done from a 13 000 ft. altitude and cost less than one cent per acre, it is stated. Dr. McCall declares general soil boundaries are outlined in the resulting pictures as well as practically all the data needed for the base-map

Florida Planes in "Aircade"

CLEWISTON (FLA)—Florida's first "Aircade" of some twenty-five airplanes was scheduled to leave here Dec 16 to fly to Miami to celebrate Everglades Day A Goodyear blimp was to lead the procession

Representatives Named

WRIGHT ENGINES, PARTS AND SERVICE—Curtiss Wright Flying Service, Columbus, Ohio

NEW STANDARD TRAINING PLANES—Mayer Aircraft Corp, Bridgeville, Pa., for western Pennsylvania, eastern Ohio, and northern West Virginia.

FAIRCHILD—Southern Air Transport division of The Aviation Corp for Texas Louisiana, Alabama, Mississippi, and Georgia

CURTISS-WRIGHT SALES CORP—H L Pritchard and Charles Adams for Georgia and eastern Tennessee

BARLING NB 3—George B Coles, Buenos Aires, Argentina, for South America

BIRD—Mankin-Ferris Co, Akron, Ohio

New Glider Record for Bowlus

SAN DIEGO (CALIF)—For the third time within two months, W H Bowlus has broken the gliding record for American pilots and craft. His latest mark was made on Dec 10, above Point Loma, where he soared for 2 hr 47 min and 13 5 sec, beating his previous record by over 1 hr. and 20 min. A favorable wind aided him during the flight which was observed by officials of the National Glider Association and National Aeronautic Association

Five Bowlus sailplanes are now nearing completion and orders have been received from all parts of the country necessitating the immediate increase of the production schedule with a unit of ten sailplanes to be started at once The Bowlus is a high-wing cantilever monoplane built entirely of spruce and plywood fabric covered The wing is built in three panels, each quickly demountable and with demountable wing tip ailerons has a total spread of approximately 60 ft The total weight of the Bowlus sailplane is approximately 175 lb

Air Engineer Posts Open

WASHINGTON (D C)—The posts of associate aeronautical engineer and assistant aeronautical engineer, to fill vacancies in the Bureau of Aeronautics, Navy Department, and in the field, are now open Selection of applicants will be made through competitive examinations Those desiring further information may obtain the same from the U S Civil Service Commission here, from the secretary of the U S Civil Service Board of Examiners, or from post offices and custom houses

TRADE TIPS

It has been reported that

The National Advisory Committee for Aeronautics has asked for bids on its projected wind tunnel which is to be sufficiently large to accommodate a full sized airplane, and on a seaplane channel, to be approximately 2,000 by 24 ft in size Funds amounting to $900 000 have been appropriated for the wind tunnel and $208 000 for the seaplane channel, it is stated.

Fliers in the region of Winnipeg, Canada, have voiced their desire for an airplane ski undercarriage capable of withstanding the shock of landing on the snow drifts of rock-like hardness which form over both the land and iced waterways of the district during midwinter Such gear still awaits development, it is thought

H J Wolcher, sales manager of the parachute division of Switlik Mfg Co, South Broad and Dye Sts., Trenton, N J—makers of the Floyd Smith chute—is about to leave for the Pacific Coast region where he will appoint distributors and dealers

A group of business men of Oil City, Pa., is seeking the services of an engineering concern to develop plans for a modern airport there, to cost from $45 000 to $60 000 and to be equipped with a hangar, machine shops, recreation rooms, etc

Steps are being taken by the students of McGill University, Montreal, Que., to form a glider club

The city of Tampa, Fla, is in the market for lighting equipment to the extent of $15,000 for the municipal airport.

Mohawk Aircraft Corp 2600 Delaware Street S E, Minneapolis, will immediately establish representation in St Louis to cover the Middle West and South. Other territorial centers for sales and service are under consideration

The city of Los Angeles, Calif, is asking bids for the erection of two modern steel, hollow tile, and concrete hangars each 100 by 120 ft, to be added to the present equipment at Los Angeles Airport at a cost of $83 000

Emsco Aircraft, with a factory and flying field in Downey, Calif, plans to double the size of its present factory by erecting a new building, 120 by 408 ft, within the next 90 days

Lockheed Aircraft Company is reported to be preparing to invite bids for the erection of a large new aircraft factory on a 30-acre site recently purchased from the Montana Land Company and adjoining the Long Beach, Calif, Municipal Airport

Bendix Acquires Propeller Unit

BALTIMORE (MD)—Merger of the American Propeller Co with the Bendix Aviation Corp was announced at the air show here The propeller firm manufactures the Paragon air screw

BRIEFLY

Proposals for erecting a 200-ft mooring mast for dirigibles on top of the 1,100-ft Empire State Building which is to occupy the site of the Waldorf-Astoria in New York City are being considered by officials of the Navy Department.

Construction of four additional aircraft carriers for the Navy has been recommended by Secretary Adams

Hearings on the progress of the five-year Army aviation program will be held beginning Jan 7 by the House of Representatives Committee on Military Affairs.

The U S S Lexington has arrived in Tacoma where for 30 days she will help to supply the city with electric power, due to the failure of the city's hydro-electric system because of drought

An international race for a $10 000 cup donated by Thompson Products, Inc, will be held hereafter in connection with the National Air Races according to a report of a recent meeting of the N A A contest committee Chicago has been tentatively selected as the site of the races in 1930

A new split-type landing gear for Parks P-1 training planes has been successfully tested and approved by the Department of Commerce

Only three per cent of passengers on T A T-Maddux lines suffered from air sickness in November, as compared with seven per cent last July

Plans for a non-stop refueling flight from New York to Buenos Aires have been announced by Herbert G Partridge The attempt is to be made next month

Daily round-trip service between Seattle and Yakima, Wash, has been announced by Inter City Air Express Company.

Fire at the Tampa, Fla, municipal airport resulted in a loss estimated at $100,000

An automatic device to enable planes to pick up mail while in flight invented by J P Jacobs will be tested by Southern Air Transport at Fort Worth, Tex

Western Air Express is offering a reduction of 20 per cent in rates between Kansas City and Los Angeles during the Christmas holidays

Reports from Washington indicate that the U S Shipping Board will refuse to lease Hog Island to the city of Philadelphia at a nominal rental for airport purposes

A branch office of Detroit Aircraft Corporation is to be established at Portland, Ore., according to a recent announcement by Edward S. Evans, president.

Pittsburgh Screw & Bolt Company has begun production of Dick aeronautical propellers, but volume production will not be started until next year

Canadian Airways, Ltd., has inaugurated daily air mail service between Montreal and the Maritime Provinces Contract for carrying mails between Oskelaneo and Chibougamau has been awarded to Compagnie Aerienne Franco Canadienne.

A recent series of fires at Love Field, Dallas, Tex., caused losses estimated at $300,000

Air express service between Pittsburgh Pa and Washington D C was inaugurated Dec 16 by Clifford Ball, Inc, and Railway Express Agency

Delegates from Nevada and Idaho met Dec 16 to discuss, among other projects establishment of an airway between Ely, Wells and Twin Falls

Pilots who have flown more than 50 hr in Sikorsky amphibions will receive gold pins from the company Mechanics will receive similar pins

Planes of Pacific Air Transport Company are now delivering shipments of fresh meat to miners near Snow Mountain Placer County, Calif, thus saving them a 25-mi ski journey

The Aviation Corporation reports a net loss of $335 389 for the quarter ended Sept 30 after depreciation and amortization charges

Cromwell Air Lines, Inc., will soon extend passenger service from San Angelo to San Antonio and Houston, Tex The company has made a 25 per cent reduction of fares during the holiday season

Weather has been interfering with transport operations in many parts of the country Lines operating from Kansas City Chicago, Richmond, and in various parts of Canada have reported several delays during the past two weeks

First planes to be built in the Vancouver plant of Boeing Aircraft of Canada Ltd are nearing completion and will be test-flown in January

Army aviation headquarters at Boston Airport has been supplied with an outboard motorboat for use in case of forced landings on the water nearby

AERONAUTICAL CALENDAR

Jan 14, 1930	S.A.E Aeronautic Meeting, Miami, Fla.
Jan 21	S A E Annual Meeting Detroit Mich
Feb 5-12	New York Aviation Show auspices Aviators Post, American Legion.
Feb. 15-23	International Aircraft Exposition, St Louis Mo
Feb. 20	Meeting of Committee on Airport Management, Standards and Ethics Hotel Jefferson St. Louis Mo
Feb. 20-22	Second Annual Aviators Reunion Aviation Post No 651 American Legion Chicago, Illinois
Mar 6-15	Second Annual Pittsburgh Aircraft Show Motor Square Garden, Brown Boulevard Pittsburgh, Pa. Office in Aero Club Pittsburgh William Penn Hotel
Mar 17	Regional Airport Conference for New England Providence R I
Mar 26-Apr 1	Cincinnati Ohio, Aircraft Show
April 5-13	All-American Aircraft Show Detroit
May 3-10	New York Aircraft Salon auspices Metropolitan New York Division Distributor-Dealers Section Aeronautical Chamber of Commerce at Madison Square Garden New York City
AIR MEETS	
Jan 13-15	All American Air Meet, Miami, Fla

United States Airways, Inc, plans to begin operation of a passenger line between Wichita, Kan, and Oklahoma City, about January, with Enid as an intermediate stop

Mrs Joan Fay Shankle recently completed a transcontinental solo flight, from San Diego to Boston, in a Stearman with Wright J-5 engine, in 30 hr. flying time

Fairfax Airports, Inc, Kansas City, Mo recently declared a cash dividend of $.25 per share, payable March 1, 1930 representing profit from the output of natural gas wells on the property

Parks Air College has purchased two gliders from Gliders, Inc.

Experimental daily air mail service between Montreal and St John, New Brunswick, was scheduled to start Dec 9.

The name of the Los Angeles municipal airport has been officially changed to "The Los Angeles Airport"

Varney Air Lines plans to establish transport service between Spokane, Wash, and Pacific Coast points to connect with Western Air Express and Pacific Air Transport, some time next spring

Requests have been made to have Utica (N Y) municipal airport designated as a port of entry into the United States

Thompson Aeronautical Corporation plans to equip all of its mail planes with radio

Cromwell Air Lines, San Antonio, Tex., report 30,000 mi of flying by company planes during November

Pioneer Aircraft Company, Omaha, Neb, plans to establish branch schools at Falls City and Kearney

Colonial Airways planes flew 93,148 mi. during November, carrying 33,484 lb. of mail and 495 passengers

The Post Office Department is considering making Rockford, Ill a stop on the air mail route between Chicago and the twin cities

On a recent 275-mi test flight from Chanute Field, Rantoul, Ill, to Decorah, Iowa, continuous two-way radio telephone communication was maintained between an Army plane and the ground station at Chanute Field

Plans for building a factory and manufacturing airplanes are being made by W E. Barrow, Joy Manufacturing Company, Joseph Bauer, and others, at Franklin, Pa

Western Canada Airways, Ltd has purchased six mail-passenger planes for use on the Winnipeg-Banff service

Florida headquarters for Stinson Aircraft Corporation have been established at Daytona Beach by J S Monroe and J Raymond, distributors, who also plan to open a branch of United Air Schools there

Sales in the southeast have been doubled by Pan American Petroleum Company as a result of use of a Sikorsky amphibion for advertising purposes, according to company officials

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PERSONNEL

Sumner Sewall, recently general traffic manager of Colonial Airways has been made assistant traffic manager of The Aviation Corporation Ben A. Pollett becomes traffic manager for Colonial W H Brown replaces Mr Pollett as local traffic manager for Colonial at Boston Earl Ward, recently operations manager of Interstate Airlines, Inc, has been made operations manager for Colonial Airways Corporation His position with Interstate Airlines will be filled by L S Jamison

Sumner Sewall

W H Bowlus has resigned as head of the technical training department of Airtech School of Aviation San Diego Calif, to devote more of his time to Bowlus Sailplane Company He is replaced by H E. Morrow Herbert A Thompson has been appointed woodshop instructor for Airtech and Cyril Smith is welding instructor

T G Williams, recently northwest division manager of Universal Air Lines, has been placed in charge of operations for Universal at Chicago Gage Mace replaces him at Minneapolis

R Stuart Murray will specialize in aviation and allied advertising accounts for Jordan Advertising Abroad, Inc, New York, N. Y

L J Beaudoin has been elected a director of Montreal (Can) Light Aeroplane Club

Jack Dempsey has been selected as physical director for Universal Aviation Corporation and will supervise the physical care of pilots

Lieut Harold C King, formerly with the Air Corps, is now sales manager of A F Staeger, Inc, New York, N Y

Douglas Corrigan is chief mechanic for the Airtech branch school at Palm Springs, Calif

Capt J W Hunt has been named production manager of American Aircraft Corporation Pittsburgh, Pa

V L Jones former manager of the Minneapolis school of Universal Air Lines, has been transferred to Kansas City

C J Lucas and E J Newsom have been added to the sales staff of H F Wilcox Aeronautics Corporation, Tulsa Okla

Miss Vera Dawn Walker who recently received a transport pilot's license, will demonstrate Panther engines for MacClatchie Manufacturing Company, Compton, Calif

J L Maddux is president of the western division of T A T-Maddux Air Lines Other officers are H E Collins, executive vice-president and treasurer, Charles H Lathrop, vice-president, D W Tomlinson vice president in charge of operations H W Beck vice-president in charge of traffic Robert H Moore secretary and assistant treasurer

E. G Barber Jr, has been made sales representative for Lockheed division of Detroit Aircraft Corporation in Los Angeles

Larry Roberts, L E. Miller, and P Engel have joined the staff of Arrow Aircraft & Motors Corporation Havelock Neb

William A Lamkey has been appointed permanent Department of Commerce factory inspector at Nicholas-Beazley Airplane Company Inc Marshall Mo

Ambassador Harry F Guggenheim has been elected honorary president of the American Chamber of Commerce of Cuba

Wing Comdr W E Steadman chief aeronautical engineer of the Canadian Department of National Defense, has been promoted to the rank of Group Captain which is the highest rank in the Dominion Air Service

Elmer G Rhenstrom, formerly chief of technical operations for Southern Air Transport, has been named assistant to the director of operations of The Aviation Corporation

E G Rhenstrom

George J Kilgen, vice-president of George Kilgen & Son, Inc, St Louis, Mo, has been elected to the midwest group of Advisory Board members of Aircraft Finance Corporation of America, whose headquarters are in Los Angeles

George B Logan, of Cobbs Logan & Alexander, St Louis law firm, has been selected as a member of the Committee of Aeronautical Law of the American Bar Association

Percy V Chaffee, mechanic of the refueling plane for the Curtiss Robin which established the world's endurance record last summer, has been appointed chief mechanic at Curtiss-Steinberg Airport

C A Nickerson, of Western Air Express, has been elected president of Wichita Air Traffic Association Other officers are C E McCollum, T A T, vice-president, Mrs Madeline Ingels, Consolidated Airways, secretary, C. T McCollough, Universal, treasurer

A F Bonnalie is now instructor in engineering at Boeing School of Aeronautics, Oakland Calif

Roy G Barton has been appointed chief accountant of the Detroit Aircraft Corporation

D V Stratton has been made director of sales for Great Lakes Aircraft Corporation Cleveland, Ohio

R S Knowlson has replaced Franklin Moore, recently resigned, as manager of Fairfax Airport Kansas City, Mo

L E. Horton has been appointed registrar and secretary of Cheyenne (Wyo) Air Service, Inc.

D Christian Gauss, recently with Pratt & Whitney Aircraft Company, has been made assistant to George S Wheat, vice-president in charge of publicity of United Aircraft & Transport Company

Guy R Stratton has been named chief pilot and operations manager for Rochester Flying Service

Ray C Robinson has been added to the staff of the Cleveland Airport weather station

Victor Evans is local manager for Colonial Flying Service at Utica, N Y.

Lawrence Enzminger, president of Midwest Aviation Corporation has been appointed superintendent of Grand Island Municipal Airport Grand Island, Neb

N H Anderson, recently with Parks Air College, has been transferred to the engineering staff of Detroit Aircraft Corporation

Schools and Colleges

University of Minnesota has installed a wind tunnel for the use of students of aeronautical engineering at a cost of $6,000

Scenic Airways, Inc, plans to open an aviation school soon in Chandler, Ariz

B F Schuster has opened a school in Chicago to teach the building and flying of gliders

South High School, Omaha, Nebraska has been holding classes in aviation for nearly a year Next semester it is planned to add a course in airplane welding and the mechanics of airplane engines

Spartan School of Aeronautics, Tulsa, Okla, has added to its curriculum a course in acetylene welding, under the direction of Albert Bailey

Universal Aviation Schools are giving students in their northern schools the privilege of transferring to Universal schools farther south for the winter so that they may be in the air as many days out of the year as possible, it is announced by Willis B Haviland, Director of Schools

Universal Flying School Cleveland, O, has recently opened its new hangar, erected at a cost of $100,000, at the Cleveland Airport

Universal Flying School at Rochester Minn, has been discontinued in accordance with the company's policy of concentrating their activities in large cities

University Flying Club has been organized at Wichita, Kansas, to enable aeronautical engineers of the University of Wichita and other students to train for pilots The club has its headquarters at the Swallow airport, and has purchased a Swallow training plane

AIRPORTS AND AIRLINES

Southwest Mail Routes Announced

Four Airways Selected For Early Development

WASHINGTON (D C)—A decision on the southwestern transcontinental air mail route, on which a hearing was held Nov 25, has been reached by the Interdepartmental Committee on Airways As was forecast in AVIATION, Dec 14, four airlines will be established Three of these lines will be linked together to offer a complete service to the Southwest. The route from the West will run along the border, going from Los Angeles through San Diego and El Paso to Dallas and Fort Worth From Dallas it will proceed to Atlanta via Shreveport, Jackson and Birmingham.

Another route will be established running from Fort Worth and Dallas to Louisville, and passing through Little Rock, Memphis, and Nashville This line, which will link with the Louisville-Cleveland route, will run somewhat parallel to the Chicago-Fort Worth and the New York-Atlanta lines, but at some distance from both of them

New Orleans will be connected with the main western route by a line running from San Antonio, to which it already has mail facilities contracted for, to a point on the line between El Paso and Fort Worth Midlands Tex, will probably be selected as the terminus for this line, although Sweetwater and Big Springs are also receiving consideration

N Y-St Louis Line Planned

The last of the four lines decided upon will be established between New York and St Louis, with stops at Philadelphia, Pittsburgh, Columbus and Indianapolis

An estimated cost for the set-up of these four lines places the expense at considerably more than $2 000 000 Aeronautics Branch officials believe that it will not be necessary to ask for a deficiency appropriation to cover the cost of establishment and maintenance In this connection it may be noted that the budget for 1931, now pending before the House Appropriations Committee, carries an increase of $2 235 380 over the appropriation of the present fiscal year, to be used for maintenance and operation of lighted airways to be established by June 30, 1930, the construction of 3 000 mi of airways in 1931, and their maintenance and operation for part of the year

The New York-St Louis route may be in operation by the spring of 1930 it was indicated as part of this line has been set up already An offer has been made by the state of Pennsylvania to secure landing fields throughout the state and place them at the disposal of the government at a nominal cost or rental.

Survey work on the western route will probably be started this spring in an effort to complete as much of the preliminary detail as possible before the appropriation becomes available on July 1 1930 Approximately a year is necessary for the complete establishment of a route

F C Hingsburg, chief of the Airways Division, states that the work of equipping the routes will probably start from each coast and work in At the present time it is contemplated to light the route on the premise that the mail will be started off from each coastal terminus at the end of the business day This will necessitate equipping both ends of the southwestern route for night flying Should delays occur over the day-flying portion of the line the mail will have to be sent on by train or hold over until the next day Eventually the whole route will be equipped for night flying, and a double schedule established The route from San Antonio to the point between El Paso and Fort Worth is expected to be flown during the day

The unit cost per mile for establishing an airway is figured by the Aeronautics Branch at $650 This includes items of $370 for lighting, $210 for mainte

(Concluded on page 1237)

Boeing On Location

SHOWING ONE of the Boeing mobile weather observation trucks which carries full meteorological equipment for the study of conditions in various parts of the territory flown over by the company's planes

Pacific Zeppelin Firm Elects New Directors

NEW YORK (N Y)—Twelve additional directors have joined the board of the Pacific Zeppelin Transport Co, Ltd They are as follows

R Stanley Dollar Dollar Steamship Co., San Francisco
Harry Chandler, Los Angeles Steamship Co
Col E A. Deeds, Director, National City Bank New York
F B Rentschler, president United Aircraft & Transport Corp, New York
G B Grosvenor president, The Aviation Corporation, New York.
Henry O Melvany Los Angeles
Kenneth R Kingsbury, president, Standard Oil Company of Calif, San Francisco
W P Roth president Matson Navigation Co San Francisco
Herbert Fleishhacker president, Anglo-London-Paris Bank San Francisco
Clarence H Cooke Bank of Hawaii, Honolulu
John R Galt Hawaiian Trust Co., Honolulu
Walter Dillingham Honolulu

Officers previously announced are

Chairman of the board, Paul W Litchfield, president of the Goodyear Tire & Rubber Co. and of the Goodyear-Zeppelin Co, president, Jerome C Hunsaker, vice-president of the Goodyear-Zeppelin Co, chairman of the executive committee Edward P Farley, formerly chairman of the U S Shipping Board and now of the American-Hawaiian Steamship Co, directors, Col Grayson M P Murphy and E. O McDonnell, both of G M P Murphy & Co, of New York City and Allan Lehman and Roland Palmedo of the Lehman Brothers, also of this city

The purpose of this company at present is to survey the airship possibilities across the Pacific to Hawaii and the Orient, with the first leg of such a line to extend only to Hawaii The studies will include the nature of probable government support in the way of mail contracts, etc, and no definite plans for the construction of ships for the service are being contemplated for the present It is noteworthy that all the American steamship companies operating in the Pacific are represented on the board and great interest in the project on their part is reported.

Present Air Mail Finance Plan

WASHINGTON (D. C.)—A plan for the financing of the air mail system has been presented to the House Appropriations Committee by Postmaster General Brown and his assistant, W Irving Glover, in charge of air mail. The nature of the plan was not disclosed and it may not be made public until the House Committee makes its report to Congress about the first of the year

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Air Mail Shows Drop in November

WASHINGTON (D C) — Air mail decreased 78,464 lb in November from the volume carried in October, according to the regular monthly report of the Postmaster General The figure for November was 623 161 lb as compared with 701,625 lb for the previous month It should be noted, however, that there were but 25 business days in November as compared with 27 in October The daily average dropped from 22,633 lb in October to 20.772 lb in November The poundage for September was 655,689, a drop from the poundage of 698,062 in August The preliminary poundage report just issued is as follows

	Mi	Sept	Oct	Nov
Boston-N Y	192	9 821	10 765	10 160
Chicago-St Louis	278	2 510	6,041	5 104
Chicago-Dallas	1 059	39 977	39 012	56 286
Salt Lake-Los Ang	600	64 771	73 466	65 821
Salt Lake-Pasco	530	24 176	26 162	23 571
Seattle-Los Ang.	1 141	22,793	25 851	20 956
Chicago-Minn	503	19 180	19 110	16 467
Cleveland Pitts	123	6 709	7 084	10 155
Cheyenne-Pueblo	199	8,903	8 934	7 164
Cleveland Louisville	345	10 189	8 689	5 956
New York Chicago	718	155 077	157 875	142 559
Chicago-San Fran	1 952	158,947	170 984	150 550
New York Atlanta	763	31 052	31 584	56,264
Albany-Cleveland	446	7 900	12,402	7 458
Dallas-Galveston	320	3 561	3 657	3 180
Dallas-Brownsville	529	2 075	7 178	7 101
Atlanta-New Orl	483	7 622	8 076	7 386
Chicago-Cincinnati	270	9 157	8 004	6 824
Atlanta Miami	736	9 551	10 992	10 893
Great Falls-Salt L	489	6 752	6 812	5 003
Chicago-Bay City	712	18 885	15 748	14 565
St Louis Omaha	403	5,814	15 785	15 047
New Orl Houston	319	3 596	4 095	5 569
Chicago-Atlanta.	768	7 912	8 582	6 853
Pasco-Seattle	449	11 282	10 787	12 532
Total		655,689	701,625	623,161

Airport Group to Meet in February

ST. LOUIS (MO.) — The fifteen members of the committee on airport management, standards and ethics, sponsored by the Aeronautical Chamber of Commerce, will meet here at the Hotel Jefferson Feb 20

Adams Pickup in Production

YOUNGSTOWN (OHIO)—Following tests of the Adams air mail pickup apparatus recently, officials of the Truscon Steel Co announced production on a large scale of the device would be started at once. Five successful pickups and deliveries of mail sacks were made on the device at the municipal airport last summer and altogether 250 pickups have been made Dr Lytle S Adams is the inventor of the device.

Boeing Now Using New Cheyenne Hangar

CHEYENNE (WYO) — Boeing Air Transport recently placed in use at Cheyenne the new hangar just completed by the Austin Construction Co. at a cost of $150,000 The new structure will hold fourteen Boeing planes of the type now in use on the San Francisco-Chicago line for mail and passenger service, or it will hold seven of the large eighteen-passenger tri-engined transports, which the company plans to put on the transcontinental schedule in the Spring

In a building adjacent to the larger hangar the Boeing company has housed machinery for repairing all planes used on the route Repairs will include motor rebuilding, wing and fuselage work and general reconditioning It is the policy of the company to take a plane out of the service at the end of 250 hr in the air and have it overhauled.

A new administrative building, which will include, on the main floor, a waiting room, restaurant, baggage and mail space, and a ticket office, is under construction The second floor will be devoted to administrative forces now having office space in the Plains Hotel in Cheyenne The building is expected to be completed about Jan 1

N. E. Airport Men In Second Conference

BRIDGEPORT (CONN)—All manner and means of securing crowds of joy-hoppers and concession patrons to airports were discussed at the second New England regional airport meeting under the auspices of the Aeronautical Chamber of Commerce here Dec 16 The scheduled speakers included David Visel, vice-president of the Curtiss-Wright Airports Corp, Col N J Boots, manager of Roosevelt Field, and Robert A Warren president of New England Air Terminals Corp, as well as a number of conferees

The most original suggestions were made by Mr. Warren who rather startled the group by his frankness and the freshness of his points. These were, in part, as follows:

That youngsters usually shooed away from airports as nuisances should, under intelligent oversight, be given the freedom of the airport on the theory that they are to be the aviation backbone of the future and merit all aviation influence possible

Let crowds examine planes

That the public likes to get into the cockpit of a plane, work the controls, inspect closely the whole structure, etc Where this is allowed by generous exhibitors or by a far-sighted owner of an old fuselage, etc, the crowds are thickest and the interest keenest It costs little if anything and is a subtle educational influence, he said

That comfort is essential on the airport as in a plane In few ports, the speaker asserted, has he found seating facilities, except in one's automobile, and there usually the best view is cut off by obstructions, etc A vast improvement is needed in comfort in open and cabin types of aircraft, as well, he said.

That only concessions and attractions which tie in with aviation should be permitted within the airport zone He frowned, thus, on the swimming pool idea and other extraneous amusements

That the public must be given what it wants and that the criterion in this regard is not the opinion of the frequenter of the airport but of the vast number which for some reason or other does not go there now

Mr Warren made the general assertion that the chief difficulty with airports and aviation now is that the costs involved are too high. The constant progression toward higher powered planes and elaborately equipped airports had for the most part wiped out a true perspective of economic demands

Mr Visel described in his talk the plan of the Curtiss Wright interests to organize an exhibition company to stage air "acts" of historical and demonstration nature in rotation at its various airports next season [This plan is described in the General News Section of this issue of AVIATION]

The next N E meeting will be at Providence, R. I, March 17, under auspices of the Chamber of Commerce.

Air Mail Statistical Report for October, 1929

ROUTE Number and Terminal	Length of Route (Miles)	Frequency (Rd Trips per Month Scheduled)	—Miles of Service— Scheduled	Actually Flown	Total Weight of Mails Dispatched (Pounds)	Amount Paid to Contractor
1 Boston New York	192	27	12 480	11 258	10 765	$32,296 31
2 Chicago-St Louis	278	62	34 472	30 625	6 029	15 236 22
3 Chicago-Dallas	1 059	62	133,670	118,691	39 010	116 891 41
4 Salt Lake City-Los Angeles	600	58	74 400	70,800	73 466	220 398 56
5 Salt Lake City-Pasco	530	62	65 720	64 660	26,162	78 411 75
8 Seattle-Los Angeles	1 141(a)	31	65 957	65 584	25 851	67 590 56
9 Chicago-Minneapolis	503	93	78,678	70 587	19 014	52,715 33
11 Cleveland Pittsburgh	123	62	15 498	13 164	7 084	21 150 16
12 Cheyenne-Pueblo	199	31	13 211	11 844	8,916	7 400 54
16 Cleveland-Louisville	545	62	44 702	36,279	8,668	10 575 04
17 New York-Chicago	718	62	115 561	100 543	157 289	127 366 37
18 Chicago-San Francisco	1 952	58	243 649	252 504	174 793	554 384 98
19 New York Atlanta	765	31	58 890	52 282	32 406	97 217 06
20 Albany-Cleveland	446	27	34 173	32 919	12,358	13 716 95
21 Dallas-Galveston	320	31	20 210	19 967	3,657	10 569 99
22 Dallas-Brownsville	529	31	32 798	32 591	7,178	20 744 06
23 Atlanta New Orleans	485	31	29 948	27 698	8,076	14 133 22
24 Chicago-Cincinnati	270	93	52 009	45 664	7 891	11 599 63
25 Atlanta-Miami	738	31	45,632	44 595	10,981	16 010 98
26 Great Falls-Salt Lake City	489	31	39,432	39 343	6 813	16 861 59
27 Bay City-Chicago	773	31	31,051	40 904	15,660	13 844 55
28 St Louis Omaha	404	62	50 096	43 384	13,774	10 809 46
29 New Orleans Houston	319	31	19 278	19 779	4 098	4 095 56
30 Chicago-Atlanta	768	31	47 818	46 742	8,569	6 685 19
32 Pasco-Seattle.	449	31	33 678	32 522	18,787	1 690 56
Totals	14 369	1,162	1,415 086	1,505,958	705,772	$1,541 901 59

(a) Southbound trip not operated between Seattle and Portland
Issued Dec 6, 1929

[NOTE—Close comparisons between the various air mail reports issued from time to time will reveal slight discrepancies in various figures These are not errors, strictly speaking but are due to various readjustments which have to be made from month to month after the figures have been released —Ed]

AIRPORT CONSTRUCTION PROJECTS

South

Improvements costing $8,200 are to be made at the Jacksonville airport at once These will include a 24-in 3 000,000 cp revolving beacon to be placed upon a 52-ft. tower, 25 additional marker cone lights 50 additional obstruction lights and elimination of soft spots in runways

The contract for a new airplane hangar which is to accommodate from seven to nine planes at Wewoka Okla. has been awarded to the Braden Steel Corporation of Tulsa It will be 60x80 ft in size

Pleasure Pier located in Sabine Lake near Port Arthur Tex and connected with the city by a driveway is to be converted into a $500,000 airport and equipped to accommodate land and seaplanes The cost of construction is to be defrayed by a municipal bond issue Complete plans for the airport have been drafted by J B Converse Engineering Company, Mobile Ala

Pending negotiations with an airplane manufacturing company Norfolk Va, will not take action on the selection of an airport site R E Lenton, of the Airport Development & Construction Co, Philadelphia has submitted a report to the Norfolk authorities on the airport situation and a supplementary survey will be made

Preliminary plans are in progress by E O Bennett, city engineer of Ponca City Okla for construction of a 125 x 210 ft hangar and administration building at the municipal airport

The Viking Flying Boat Company's new hangar, 80x100 ft., has been completed. It is of reinforced wood frame construction with 2-in Florida yellow pine flooring Adjoining the building is a repair shop

A new 100x100 ft hangar will be erected at a cost of $1,200 at the Tyler (Tex) Municipal Airport on the Dixie Highway Grading for a 4,500-ft. runway and for landing areas also has been undertaken

Vero Beach (Fla) authorities have been notified to execute a ten-year lease on the municipal airport to the Department of Commerce and have been provided with funds to clear the field and build necessary buildings

Marshall C Hoppin airport engineer of the Aeronautics Branch, conferred with Rawley Holcombe secretary of Wheeling (Va) Chamber of Commerce and others relative to an airport for Wheeling

East

The Scranton, Pa, Chamber of Commerce Executive Committee has recommended a 180-acre tract at Schultzville 5½ mi from the city line, for development as a municipal airport The survey covered several months and estimates approximate cost of the development as $250 000 This would include preparation of the ground erection of hangars and administration building and lighting etc No action has been taken yet on this recommendation The development is to be undertaken by popular subscription through a stock company The work will start Jan. 20 William S Hallstead is president of the Scranton Airport Corporation

The Halifax (N S) Board of Public Works has passed a resolution recommending that the City Council seek legislation to borrow $75,000 in addition to $150 000 already borrowed for the development of the Halifax Airport The various owners of the proposed site are asking $111 928 for property which is assessed at $41,140 The city proposes to offer $62 000

About 540 acres of the Pittsburgh, Pa, municipal airport are being graded and cross-drained now Recently the owner of 78 acres of land desired for the airport project was awarded by jury verdict $40,000 for the tract A board of viewers had estimated the value of the land at $24 125

Formal opening of the new hangar at the Rochester (N Y) Airport will take place Jan 1, according to Ira Keubel, acting manager of the port The new hangar which will accommodate 24 planes and include machine shops and administrative offices originally was to be opened Nov 1 but delays have been caused due to the inability of contractors to secure steel parts

Central

The city council at Hastings Neb, has selected a 200-acre tract of land 2 mi from the city for a municipal airport site Bonds to the amount of $50,000 for the port were voted at a recent election

The Akron (Ohio) City Council has approved a bond issue of $687 000 to be used largely for development of the municipal airport This issue brings the total airport cost up to $1 826 000 A final bond issue of $314 000 will be required in 1931 to complete the port This will make a total expenditure of $2 150 000 when the 800-acre port is finished

About $65 000 was paid for land near Havelock a suburb of Lincoln Neb, and now it has been agreed to spend about $200 000 to convert these 325 acres into a modern airport The field will be called the Union Airport A 120x100 ft hangar will cost about $50-000 and the administration building about $100,000

A 256-acre tract costing $255 000 has been acquired near Dallas Mo just outside Kansas City for the development of an airport for the city by a stock company William J Kennedy was one of the purchasers Sixteen thousand feet of tile are already in place and producing gas wells are included in the land

B Russell Shaw Company Inc, St Louis is preparing a program for the development of the St Louis Municipal Airport also known as the Lambert-St Louis Airport The plans call for double runways in each direction as well as a budget for the expenditure of the balance of $2 000 000 bond issue

T.A.T. Revises Coast Schedule

SAN FRANCISCO (CALIF) — Effective Dec 12 connections with the T A T line are made by the plane from this city at Barstow instead of Los Angeles Flag stops are made at Bakersfield and Fresno The transcontinental plane leaves Alameda airport at 7 15 a m daily. Throughout the racing season a special T A T-Maddux plane will leave here at 8 45 a m daily, going via Monterey and Del Monte to arrive at Agua Caliente at 1 30 p m The Valley Flyer for Fresno, Bakersfield Los Angeles and San Diego now leaves Alameda airport at 10 15 a.m. daily

S.A.F.E. Sells Commutation Books

OKLAHOMA CITY (OKLA) — Airplane passengers can now travel from this city to Tulsa for $8 23 or $1 09 more than rail and Pullman fare, under the new commutation ticket plan adopted by Southwest Air Fast Express The books hold twelve tickets and cost $100 each The line is also issuing round trip tickets for use on Sundays for $12 This includes transportation to and from the airport in both cities This makes the fare approximately $0 05 per mile, half of the regular rate

Winnipeg Continues Air Activities

WINNIPEG (MAN)—Extensive flying operations and building activities are being carried out by local commercial and private interests this season Previously aeronautical affairs have been inactive during winter months. Bids have been asked for building a $10 000 club-house, for the Winnipeg Flying Club Two hangars one owned by the Western Canada Airways and the other by Northwestern Airways are under construction and will be completed before another month

Alameda Improves Army Offer

ALAMEDA (CALIF) — As a further inducement toward establishment of the proposed Pacific Coast Army Air Base here the city has authorized an increase in the area of the site offered from 311 to 1,108 acres Two conditions are attached to the offer The first is that the site be accepted by June 30, 1930, and the second that contracts for a minimum of $500 000 for improvements of the site be awarded within one year after a special city election validating the offer to the federal government

Western Canada Reports Traffic

WINNIPEG (MAN)—Western Canada Airways Limited with head office in this city has issued, in part, the following statement of expansion during the 30 mo of operation

	Hours	Passengers	Express (lb)	Mail (lb)
1927	1 502	1 747	420 730	
1929	5 132	11 394	1 058 676	261 452

This company's sixth new Fokker mail plane arrived here from New York last week

Stout Firm Carries 100,000th Passenger

DETROIT (MICH)—Gov Fred W Green, of Michigan stepped aboard a Stout Air Service airliner here Wednesday Dec 11, to make the scheduled trip to Cleveland as the Stout company's 100,000th airline and aerial tour passenger Governor Green was the Stout concern's 50,000th passenger about a year ago in an aerial sightseeing flight over Detroit. Ralph Reed chief pilot for Stout, who piloted the governor on that occasion, also flew the plane on Dec 11 William B. Stout president of the company and James E Devoe first passenger on all of the three lines inaugurated by Stout, accompanied the governor on the Cleveland trip

Stout Air Services Inc, said to be the oldest regular schedule aerial passenger service in the United States was organized Sept 3, 1925 and opened its first line between Detroit and Grand Rapids, Mich., Aug 1, 1926 This line was discontinued Aug 31 1927 and the company, on Nov 1 the same year inaugurated its Detroit-Cleveland line The Detroit-Chicago division was added to the service Nov 1, 1928 and on Nov 1 this year "local service" was inaugurated on the morning runs

Wilmington Selects Plane Basin

WILMINGTON (DEL.)—City commissioners have designated the anchorage basin at the Liberty shipyards, inside the city limits as a special area reserved for seaplane landings. The anchorage is 1 000x3 500 ft

Detroit Has Fine Private Hangar

DETROIT (MICH)—In the $200 000 hangar recently completed by Lawrence P Fisher vice-president, General Motors Corporation, on City Airport, here, Detroit has one of the finest private hangars in the United States The Fisher hangar is 200 ft long and 100 ft wide being large enough to house two large transport planes and several smaller ones Among other features it contains living quarters for the crew of Mr Fisher's plane and space for a promenade on the roof Landscaping and additional beautifying work is to be done next spring As vice-president of General Motors Mr Fisher has a considerable hand in the affairs of the Fokker Aircraft Corporation, its subsidiary, and owns a Fokker F-10 De Luxe of his own

Gets Canadian Mail Contract

MONTREAL (QUE.) — The contract for carrying the mails between Oskelaneo and Chibougamu has been awarded by the Post Office Department to La Compagnie Arienne Franco Canadienne, which has heretofore specialized in air photography Maurice Quedrue, managing director states that service is to begin before Christmas. Oskelaneo is located on the Canadian transcontinental line, 285 mi northwest of Quebec City It is the gateway to the Rouyn mining district The company will operate two Potez cabin monoplanes, daily, weather permitting Under contract from the Department of Lands and Forests of the Province of Quebec the company has photographed 7 550 sq mi of territory

T.A.T.-Maddux Station at Albuquerque, N. M.

A MODERN passenger building has been completed at Albuquerque for the transcontinental air-rail travellers The lower photograph shows the Indian adobe style of architecture of the building and the photograph on the right shows the interior of the waiting room An equally attractive dining room adjoins Furnishings include old Indian and modern pieces The building was opened Dec. 12. Meals will be served here instead of at Clovis, as heretofore The dining room is furnished in hand-carved tables and chairs, several of which are said to be more than 100 yr old Meals are prepared by the Fred Harvey Co, contractor to T.A.T.

Lincoln, Neb., Sets Up Rules For Airport

LINCOLN (NEB) — Business-like administration of the local municipal airport is being sought through machinery recently put in operation under authority of a special ordinance passed by the city council.

The ordinance establishes the Municipal Aviation Field Department and authorizes this department to buy and sell gasoline, oil, electric current water and other commodities used in the operation and maintenance of the municipal airport, and to collect rentals and to use money so received for the airport Mayor Love is in charge of the department and has the aid and advice of an advisory board, of which Verne Hedge is chairman

The ordinance provides as follows

Section 1 That the Municipal Aviation Field Department is hereby established and authorized to buy and sell gasoline and oil electric current water and other commodities needed or used in the operation of the municipal aviation field and to collect rentals.

Section 2 That the following rules be and they are hereby adopted governing the operation of said Municipal Aviation Field Department

Rule 1 The manager shall keep and preserve an accurate account of all business transacted by the Department, showing the cost of gasoline oil, electric current water freight demurrage delivery and all other items of expense incidental to the buying and selling of said commodities together with a complete statement of all receipts.

Rule 2 The manager shall deposit with the city treasurer all money received or collected by the Department, which shall be placed in the aviation field fund by the city treasurer and all money so received and deposited may be used in the operation and maintenance of said municipal aviation field

Rule 3 No expenditures shall be made except upon the filing of a claim with the city clerk, allowance made by the city council and warrant drawn therefore as provided by law

Rule 4 The manager shall make a monthly report of the business transacted and file same with the city council at the first regular meeting each month the report to contain a summary of the financial statement as required in rule 1 the commodities purchased the commodities sold, and the commodities on hand

Southwestern Routes

(Concluded from page 1234)

nance and $70 for teletype service. Expenditures for radio beacons and broadcasting stations are additional to this cost The southwestern routes will be fully equipped with radio and teletype These airways will probably be completed by the middle or end, "of 1931

The Interdepartmental Committee on Airways has recommended to the Postmaster General that bids for the transportation of air mail be invited but has set no date for the opening of the bids

Hearings for the selected routes and proposed variations of them have been going on at intervals since June On the twelfth of that month a hearing was held on the Louisville-Dallas line Another hearing was conducted on Aug 1 on the proposed New York-St Louis route, with the final hearing on the southwestern transcontinental route being held Nov 25

FOREIGN ACTIVITIES

Free Crash Repair Planned by DeHaviland

LONDON (ENGLAND)—The DeHaviland Aircraft Company has announced that beginning Dec. 1 of this year it would undertake to repair free of charge to the owner all damage to aircraft resulting from a forced landing caused by the failure of a DeHaviland Gipsy engine, if the engine and airplane were delivered new and unused to the owner on or after Dec 1, 1929 This unusual contract follows the recent successful 600-hr reliability test to which a Moth fitted with a Gipsy engine was submitted The engine, it will be remembered, ran better than 600 hr with practically no replacement and no overhaul beyond the usual routine attention

There are certain stipulations to this agreement, of course The repair contract will be in effect 12 mo following date of delivery of the machine and engine. It covers any British plane having a British certificate of air-worthiness and registration and only machines being used for private flying training, taxi work and ordinary operation Racing, non-stop and special flights are not covered.

This service does not apply to second-hand machines unless the company at its discretion decides to transfer the agreement to the new owner based of course, upon the record of the machine and engine to be transferred The agreement also covers only failures of engine parts which are manufactured under the control of the DeHaviland company directly This would rule out such items as magnetos spark plugs, carburetors, gasoline and oil lines, etc. It is stipulated that maintenance in accordance with the DeHaviland standards must be accorded the engine by the owner previous to the crash

Poland Plans Lighted Routes

WARSAW (POLAND)—Plans for lighting various airways in Poland have been the subject of study for some time by Engineers Kuza and Pawlikowski appointed by the government During the next five years, the government expects to spend $2,016 000 on the lighting of various air routes According to the most recent announcement, the first line to be lighted will be Zbaszyn Poznan-Warsaw-Leopol, to the Roumanian frontier Plans are also being made for a line from Paris and London to Berlin, Warsaw and Moscow, with a branch to Leopol, Czerniowce, Bucharest, and by way of the Black Sea to India The Polish part of this route, and eventually all of it, will be lighted, according to plans

Aviation Increases in Iceland

REYKJAVIK (ICELAND)—Steps to increase its capital to 200 000 crowns (about $52,000) have been taken by the Icelandic Aviation Company Five additional Junkers seaplanes will be added to the two now in service, and flying activities will be greatly increased at the beginning of next season, according to the announcement

French Developing Equipment of Airports

PARIS (FRANCE) — Equipment at Le Bourget Airport is becoming insufficient to cope with ever increasing traffic Part of the subsidy granted by the government for civil aviation is destined to establish enlarged buildings and concrete sheds, as well as for extending area of traffic platform.

The Querqueville Airport, near Cherbourg, is to be much enlarged and the Cherbourg - Urville tramline will be modified so as to pass near the new buildings This field is particularly important by reason of the trans Atlantic steamship traffic Special plane services are being established for mail and passengers

The Chamber of Commerce of Rouen has decided to allow a sum of about $1 950 for its participation to the establishment of an airport near the town at Le Madrillet.

British Investigate Evaporative Cooling

LONDON (ENGLAND) — Considerable attention has been paid recently to the value of evaporative steam cooling in reducing the weight to power ratio of the water-cooled engine and improving efficiencies generally. The British Aeronautical Research Committee has been carrying out tests with steam radiators, both on the bench and in the air, using a standard aero engine The committee reports that the engine gave satisfactory results as regards fuel economy and endurance in bench tests of 16 hr and flight tests of 26 hr, using a mineral lubricating oil in place of the usual treated castor oil.

Wind tunnel tests have been made on a steam condensing wing radiator consisting of the portion of the wing ahead of the front spar, as proposed by Wing-Commander T R Cave-Browne-Cave, and a high rate of heat dissipation was realized The cooling per unit surface was some 60 per cent greater than that of a wing radiator occupying the whole surface and this bears out some other experiments which indicate that it is the forward portion of the wing, practically the leading edge, which is most efficient from the viewpoint of heat extraction The experiment is important for success in this direction will mean the reduction of the present radiator surface less weight in water carried and better cylinder temperature.

Tail-less Plane Built by Lippich in Germany

PILOT GROENHOFF at the controls of the machine, built by Herr Lippich, at the time of the recent test flights at Tempelhoff Airdrome Berlin Note the skid for ground contacts and the close resemblance to the glider type of construction from which the machine was evolved The rudders are located at the wing tips.

Espenlaub Tail-less Plane Ready For Tests

WELL-KNOWN for his glider activities Herr Espenlaub has extended his interest to the tail-less type He is shown here in his two-place machine at recent tests at Tempelhoff Airdrome. Note the wheel undercarriage

English Auto Man To Build Aero Engines

LONDON (ENGLAND) — Sir William Morris, who may not unfairly be likened to an English Henry Ford, has decided to enter the aviation field He is to concentrate on an aero engine of medium power likely to command a ready world sale. So far no details of his plans have been made public, but it is learned upon good authority that he proposes to market a seven cylinder air-cooled radial of about 145 hp It will be a geared engine, and a mixing fan in the induction system should impart a small supercharging effect

Wild statements have appeared that he was going to bring aero engines prices down to approximately $5 per horsepower, but Sir William Morris is laboring under no such delusion He has engaged technical consultants, has prepared the designs, but realizes that the manufacture of an aero engine cannot be compared to the mass production of a car engine Still he expects to cut the price by about half that of any existing engine of around the same power, and, it is understood, is prepared to invest large sums in laying down a proper tooling plant to achieve the low costs essential to a comparatively priced engine intended for world sale The first engine is expected in about six months' time.

Mexico Expands Air Service

MEXICO CITY (MEXICO) — An nouncement is made by the department of aeronautics of the Ministry of War and Marine that 4,000 000 pesos (about $2 000,000) will be spent during the next year in the development of the Army Air Service, both for the purchase of new planes and for equipment for government aircraft factories This represents a considerable increase over the appropriation for last year, and it is estimated that by the middle of next summer the Air Service will be more than double its present size

Record Made to Mexico City

MEXICO CITY (MEXICO) — Pilot Charles M Drayton of the Mexican Aviation Company bettered his own speed record for the trip to this city from Brownsville, Tex, when he landed a heavily laden Ford here last week 3 hr 40 min after leaving the Texas city Drayton recently made the journey in 3 hr 55 min The air distance between the two cities is 478 mi. The pilot made particularly good time on the 252 mi run between here and Tampico, negotiating this mountainous region in 2 hr 5 min The plane carried five passengers, a radio operator and steward, 163 lb of baggage, 25 lb of express and 71 lb of mail.

Announce Tempelhof Port Operation Figures

BERLIN (GERMANY) — Operations at the Tempelhof Airport during the business year 1928 resulted in a net profit to the share holders (City of Berlin, federal government and State of Prussia) amounting to 183,845 marks ($44,120), according to a report obtained by the U S Department of Commerce representative here Of the total receipts, 101,146 marks ($24,265) were from starting and landing fees, 149,456 marks ($35,866) from rental of hangars, repair shops, and office rooms, mainly to Deutsche Luft Hanse Both of these items represented an increase of from 30 to 40 per cent over 1927 Starting and landing fees are now 7 3 marks ($1 75) and 9 6 marks ($2 30) for single and multi-engined planes

Construction work during the year cost 1,565,000 marks ($375,600) and consisted mainly in an enlargement of the administration building to include larger restaurant space and hotel rooms Eventually it is expected to be five times its present size Runway space in front of the hangars was enlarged, and the area of the field increased to 1,500,000 sq m. (16,146 000 sq ft) Plans are now being made for placing neon obstacle lights on all tall structures in the vicinity.

Plan Air Service For French Indo-China

PARIS (FRANCE) — The Compagnie Air-Asie, headed by M Jacques Breguet is preparing, in conjunction with the Compagnie Air-Union and the Compagnie Air Union-Lignes d'Orient for the establishment of a route joining France to Indo-China, as well as of a net of airlines within that large French colony The line is to pass through Calcutta, Akyab, Rangoon, Hong Kay, Vinh, Haiphong, and will be extended later towards China and Japan, by Canton, Shanghai and Tokio.

For the net in Indo-China, three routes are contemplated 1, Pitsanoulok, Bangkok, Angkor, Pnom-Penh, Saigon; 2, Hanoi, Vinh, Tourane, Nha Trang, Dalat, Saigon; and 3, Luang-Prabang, Hong Kay, Savannakek, Kratie, Saigon.

In addition, a very interesting organization of sightseeing trips is to be opened next April. The steamships from Europe to eastern Asia remain three days in Saigon harbor, where passengers are anxious to find interesting things to visit. The magnificent ancient ruins of Angkor are but 280 mi. away Unfortunately, the existing means of transportation are far too slow to enable the return journey to be made inside the available time A plane service would allow passengers to spend two nights and a day in Angkor-Vat and Angkor-Thom, and make a thorough visit of these places Another air circuit for tourists is intended for travellers during wait at Bankkok, the destination being again Angkor, 255 mi away.

Imperial Airways Cuts Fares

LONDON (ENGLAND)—Substantial reductions in the fare on Imperial Airways planes from London to Paris have been announced The fare on the 8 a m. airliner is now only £3 10s ($17), less than the first-class fare by boat and train On the de luxe service, leaving this city at noon daily, the fare has been reduced from £5 15s to £4 15s. ($23) The fare to Switzerland has also been reduced from £7 10s to £7 ($33 90).

French Line Improves Schedule

SAO PAULO (BRAZIL)—Daily passenger and mail service between this city and Rio de Janeiro is planned by Compagnie Génerale Aéropostale, according to an announcement by M Bouilloux Lafont, president Application for government license to operate and mail concession has been made It was recently announced that New York, Rio & Buenos Aires Line would inaugurate a tri-weekly service over the same route.

P.A.A. May Extend Line

MIAMI (FLA.) — Extension of Pan American Airways' line down the east coast of South America from Paramaribo to Rio de Janeiro, Montevideo and Buenos Aires is now under consideration, it is reported

Costes-Bellonte Flight Draws Russian Protest

MOSCOW—(U.S.S.R.)—Protests against the alleged violation of terms under which permission was granted to Costes and Bellonte to fly over Russian territory have been addressed to the press of various countries by L. Malinowsky, secretary-general of *Ossoaviakhime,* official society for the promotion of aviation. According to the protest the two aviators were given the privilege of flying over Russia only with the agreement that they would not cross the regions in the far east now occupied by Red armies

Specifically, it is charged that in flying over Irkutsk and landing in Manchuria, the pilots of the "Question Mark" took unfair advantage of the courtesy which had been extended to them by the Russian government and violated the sovereign rights of the U S S R It is further pointed out that such flight over military zones is expressly forbidden by the laws of France and other nations as well as in Russia and that such violations of national rights are detrimental to the creation of international agreements regarding air transport

List Heights for Channel Fliers

LONDON (ENGLAND) — Approximate heights from which it would be possible for land planes flying across the English Channel to land safely in the event of engine failure have been listed by the Air Ministry Subject to weather conditions, the new regulations prescribe heights varying from a minimum of 2 000 ft. for three-engined planes to 10 000 ft for light single-engined machines flying the long route from Dungeness to Etaples The minimum for single-engined planes on the shortest route 11 mi. from Dover to Calais, is 5 000 ft.

Increase Montevideo Service

BUENOS AIRES (ARGENTINA) — Increase of service over New York, Rio & Buenos Aires Line between this city and Montevideo, Uruguay, to three round trips daily, went into effect Dec 15 The route has been flown each way daily for the past three months, during which time 1,809 passengers have been carried The fare $18 50 one way, is only about 33 per cent higher than steamship fares, although the trip by plane requires but 1 hr 30 min. as compared with 16 hr. by boat

K.L.M. Carries Tons of Flowers

THE HAGUE (HOLLAND) — During the first nine months of 1929 K L M planes carried 1 344 565 lb of freight as compared with 1 497 760 lb for the whole of 1928 The increase seems to consist largely of flowers and fruit as these two items represent 49 per cent of the goods carried this year

Foreign News Briefs

Squadron Leader A. H Orlebar and Flight Lieutenant Stainforth members of the British Schneider Cup team will pilot the same planes in further attempts to raise the world's speed record.

Col Pablo L. Sidar, Mexican good-will flier is to be presented with a house in appreciation of his services

The Australian government plans to spend $186 000 for the development of the Mascot airport, Sydney, according to recent reports

Sir Alan Cobham is surveying a route for air mail from London to Cape Town, South Africa

Students at Heston Air Park, near London, receive instruction by wireless during their first solo flights

London Aeroplane Club, Stag Lane has 520 members, and National Flying Services' Hanworth Club has 534 making them the two largest in the world The latest official estimate of membership in all English flying clubs places the total at more than 5,000 of whom 1,000 have pilot's licenses

The German Dye Trust is reported experimenting with a new type of carrying gas for airships which will be non-inflammable

A record of 95 min. for a London-Paris flight at an average speed of 145 m.p.h. was recently made by an Imperial Airways passenger plane

Arrangements have been made for sending British mail to South America by way of New York to be forwarded by air mail to Honduras Panama, Ecuador and Peru

International Airways, a new $100 000 corporation plans to establish an air-line between Agua Prieta and Nogales Cananea Hermosillo Montezuma and Nacozari Mexico

Controlling interest in Simmonds Aircraft Ltd London has been acquired by Whitehall Securities Corporation, Ltd, and considerable expansion of the business is planned

Plans for a trans-Atlantic flight next spring have been announced by Col Roberto Fierro, Mexican Army aviator

Six radio stations, exclusively for aeronautical use, are being built in Japan according to reports received by the Department of Commerce

A successful shipment of live chicks from the United States has been made to Mexico City, and the Avicola Company, consignees announces plans to receive all shipments by air hereafter

Argentina is to inaugurate a training school for pilots at Rosario

Condor Syndicate is considering extension of its South American lines to Buenos Aires

Plans for an airline in the West Indies submitted by Atlantic Airways, Ltd. have been approved by the British Air Advisory Committee

A large all-metal flying boat of modified Dornier Wal type has been built for the Japanese Department of Communications by the Aircraft Section of Kawasaki Dockyard Company. It carries two 600 hp. B M W engines

Training in blind flying is now compulsory for Deutsche Luft Hanse pilots

Peruvian Naval Air Lines have extended mail service to Yurimaguas and Moyobamba

Use of airplanes of foreign register by oil companies has been authorized by the government of Venezuela

Royal Geographical Society has completed an extensive aerial survey of previously unexplored portions of central Australia

Plans for a new $250,000 airport have been announced by the New South Wales, Australia Aero Club

A cantata by Kurt Weil entitled "Lindbergh's Flight" was sung recently in Berlin

Flying boats of the Royal Air Force are being used to study the meteorological conditions over the proposed Calcutta-Singapore air mail route The machines have been used to collect data particularly on flying conditions during the monsoon period It is reported that flying in the monsoon is much like flying in fog but has the additional disadvantages of rough air and wind

Air mail service between Rome and Tunis was inaugurated Dec 13 and is scheduled bi-weekly Passenger service will be provided later

A prize of $2 500 has been offered the first person of Indian nationality to fly solo from India to England or vice versa The flight must be completed within six weeks after the take-off

A report has been received in England regarding the loss of the Imperial Airways flying boat on the London-Karachi service but it serves merely to confirm the understanding that one engine had developed trouble and then failed altogether and that the immediate cause of the tragedy was the parting of the tow line which the Italian steamer had thrown out The flying boat was not seen again after the hawser had failed

The Department of War in Argentina has received an appropriation of 450 000 pesos ($184 500) to be used for reopening the airplane factory at Cordoba Of this amount it is understood that 220 000 pesos ($90 200) will be used for the acquisition of engines accessories and raw materials

Havana Harbor Pleas Denied

HAVANA (CUBA)—Efforts of Captain of the Port Valiente to secure the adoption of special regulations for the protection of seaplane traffic in the harbor here were defeated by opposition from harbor pilots and representatives of shipping companies New York, Rio & Buenos Aires Line and Pan American Airways had both asked for restriction of anchorage along certain runways but the requests were denied The latter line therefore, will probably not use Havana harbor

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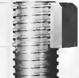
THE BUYER'S LOG BOOK

Dardelet Screw Thread

A NEW self-locking screw thread adapted to bolts studs screws, machine and engine threaded parts and other special applications has recently been placed on the market by the Dardelet Threadlock Corporation, 120 Broadway New York City The nut is put on and taken off in the usual manner with an ordinary wrench and remains locked whenever turning with the wrench is discontinued Both bolt and nut are solid metal throughout.



A magnified photograph showing the Dardelet principle

The device owes its locking ability to the profile of the thread which makes auxiliary locking devices unnecessary The locking portion of the screw thread lies at the root of the bolt thread and the corresponding crest of the nut thread these faces being tapered about 6 deg and leaving considerable end play between the sides of the thread. When the nut encounters a resisting surface and can no longer travel along the bolt, further turning forces the tapered face of the nut thread along the corresponding face of the bolt thread with a wedging action, until the upper side of the square nut thread is stopped by the lower side of the square bolt thread The tapered thread faces of the bolt are elastically compressed and those of the nut elastically expanded this pressure providing the locking action of the thread

Moisture Meter

A NEW ELECTRICAL DEVICE for determining the moisture content of lumber and known as the Tag-Heppenstall moisture meter is made by the C J Tagliabue Manufacturing Company, 18-88 33rd Street Brooklyn N Y The manufacturer states that the electrical conductivity of wood measured across the contact needles is, with a few rare exceptions an accurate measure of moisture content The instrument weighs 20 lb and consists of a case 10x10x12 in. high to which the testing handle is connected by 10 feet of flexible cable. The handle is fitted with double needle contacts and a small electric lamp used when sorting out wet stock On the panel are the milliammeter, control switches and selector switch graduated from 7 to 24 per cent moisture Dry batteries contained in the case are used for the operation of the instrument

Fairbanks Airplane Scale

A PORTABLE SCALE for airplanes adapted for weighing any size plane up to its maximum capacity of 10,000 lb. per wheel is announced by Fairbanks, Morse & Company Chicago, Ill Designed to be used in pairs made up right hand and left hand so as to have one scale for each landing wheel of the plane, the scales are equipped with hydraulic jacks so located that they can be spotted underneath the pad of the axle on the inside of the landing wheel, or they could be located outside the wheels where hub extensions are provided

Fairbanks portable dial scale

A portable dial scale wheeled under the axle of the plane eliminates the necessity of moving the plane itself After taking readings in landing position the tail skid can be raised to flying position and the scales under the landing wheels moved about until the platform hangs plumb after which readings can again be taken The scales are mounted on ball bearing swivel castors and provided with a removable platform which can be used for weighing wings fuselage and other heavy parts The dial has 10 lb gradations and vernier on the pointer assures accuracy to 1 lb.

In order to plumb up the scales so that the weighbridge will set without side thrust, there is an indicator attached at each end of the weighbridge which moves over a circle on the frame of the scale and is so adjusted that the cross lines on the indicator will correspond with crosslines on the circle when the weighbridge hangs plumb After the plane is mounted on the scale the scale is moved about until these indicators show exactly above their marks.

TRADE CATALOGS

AERONAUTICAL PRODUCTS In a 19 page booklet recently issued and fully illustrated with pictures of rubber products and also of the plantations where the rubber is obtained, the U S Rubber Co, 1790 Broadway, New York, sets forth important facts in regard to the manufacture of airplane tires, tail wheel tires, inner tubes, shock absorber disks and cord, and miscellaneous molded rubber products for airplanes

THE D. H. GYPSY MOTH The outstanding features of design found in the D H Gypsy Moth are presented in a 24 page catalog just published by the Moth Aircraft Corporation The catalog shows various views of the plane and describes briefly the important points in construction Specification tables of the Gypsy engine, together with performance data weights and dimensions of the plane are included

AIRPLANE HARDWARE—A new loose leaf catalog issued by the Aero Supply Manufacturing Company, Inc, lists numerous items of airplane hardware detail parts, accessories and raw materials It also contains such useful information as a table of comparison of wire gages, table of decimal equivalents Rockwell, Scleroscope Brinell and tensile strength relations

AIRPORT AND SERVICE STATION EQUIPMENT A recent 29 page catalog presents briefly the service station and airport equipment manufactured by the S F Bowser & Co, Inc Airport fueling systems both for gasoline service and for water and air service and a portable lubricating oil outfit for use at airports are described and illustrated Some other types of equipment presented in the catalog are electric and air operated pumping units, oil drainage and filtering systems, underground tanks, and accessories

WHAT OUR *Readers Say*

Cheaper Airplanes

To the Editor:

I have just concluded your editorial, "Cultivating Airplane Sales Soil" and feel that you are absolutely right in your reference to the state of the market for light and medium planes. I think there is quite a percentage of the 120 million people of whom you speak, would-be aviators like myself, providing we have the same opportunity to acquiring knowledge of operation and of ownership as we have in the case of the automobile. The man of average means will pay to the full extent of his financial means for the automobile he wants and the automobile industry has always operated with consideration for the fact that there is more than one class of customer to sell to. It seems to me that the aircraft manufacturers are restricting the sale of their products by price alone, appealing to the Rolls-Royce, Packard, and Pierce Arrow class of automobile owners.

Most of us are obliged to take flying instruction during spare hours and at a high cost. At present there is no incentive for the small-town business man to leave his business from four to six months to attend a flying school without any prospect of ever owning a plane. The same applies to the thousands of fair-salaried and moderately well-to-do.

I am not going to attempt to say what the light or medium airplane should sell for. Perhaps they are now selling at rock-bottom prices according to manufacturing and sales costs. If that is the situation there are a lot of us hopefuls who will remain in he realm of the landlubbers and a lot more money the industry will never get.

B. V. D.,
Langdon, N. Dakota.

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On Making It Easy

To the Editor:

What would have happened to the automobile industry in its early days had some Government department been organized, officered by professional drivers, automobile mechanics and other experts, whose ideas ran to technical extremes? How many automobiles would have been sold if this Government department made a definite, expensive "course of instruction" necessary to obtain a license to drive? Happily the automobile was saved from this smothering process!

The professional aviation expert insists that the air is "different" from driving an automobile, but reason impels one to ask if there is not an element of danger in travelling at 40 m.p.h. or more, driving an automobile weighing over two tons, in present traffic conditions. It requires a clear head, good eyesight and experience in driving. In reality, brushing aside all the laborious "Courses," I believe that these three factors are about all that is really necessary for successful private flying.

When I became "airminded" I discovered that only three doctors in Chicago were authorized by the Department of Commerce to examine for aviation. (Three examiners for over three million people.) However, I passed this examination and then looked about, thinking to learn to fly with a few explanations. My amature idea was to have the "gadgets" pointed out, taxi around a bit and presently go up with a teacher in dual control and then solo when capable. I anticipated a hundred dollars or so plus rental and plane insurance. If I learned, then I was amply able financially to buy a plane. But it was not so simple.

I was approached by several air school salesmen and soon found that the "instruction" was very much commercialized. It would cost me $600 for a private pilot license. It would be necessary for me to attend ground school and lectures. In fact anyone busy in their regular occupation cannot spare time to learn to fly unless they take a vacation and devote intensive study to this particular subject. I applaud technical knowledge if one is to make aviation a life work but why all this detail just to learn to fly?

If I were to buy a plane all I would care to know, to begin with, would be how to handle and maneuver it in proper manner. I have no time to study the details and dynamics of airplanes any more than I enter into arguments in favor of straight eights or the sleeve valve construction of gasoline engines. All I want is to learn to fly and I believe there are thousands deterred from flying (and buying) airplanes because of these required courses of instruction. The manufacturers may be losing customers just so a few professional pilots and lecturers may teach their lessons.

In this automobile age the majority of our population can drive a car, whether they own one or not. The driving mechanism is so standardized and simplified that almost anyone can drive almost any car. If an airplane had a wheel, instead of a stick, at once we would feel "at home" and with other features similarized we could quickly learn the additional tricks. If it were the object of airplane engineers to standardize along automobile lines and the endeavor of airplane authorities to simplify the process of becoming a private pilot, then I believe the problem of the sale of airplanes would be quickly solved.

Particular technical capability and examination may be necessary for professional pilots handling passenger planes, but most of use (possibly a half million) "would-be" private pilots could be happy if we were able to make a few hops in clear weather. We would not need to know as much as is taught in a school. Show use how to fly and make it costly if we hurt anybody. Standardize driving mechanisms and teach free any one financially able to buy a plane. Insure student planes and instructors and make students pay this insurance. Bring pressure to bear on any insurance company whose policy does not cover airplane flying. You would soon see a nation in the air and mass production would be hard put to it to keep up with the demand.

William F. Worcester,
Chicago, Ill.

[Needless to say, we do not agree with Mr. Worcester about the simplicity of learning to fly and the possibility of radically reducing the cost of instruction at the present time. The difficulty is with inadequate rather than with excessive instruction. His letter, however, expresses a grievance sincerely felt, and it is interesting to know how many other men and women with a strong desire to fly but without knowledge of the technical details of aviation agree with him.]

• • •

Impolite Pilots

To the Editor:

Being interested in making flying, fliers and aviation in general popular I have a suggestion to offer. I hope that you will receive it in the same spirit as it is intended.

The writer has a private airport, simply for my own use and for any one who is willing to take a chance on it. It has been very convenient for many pilots who pass this way.

With few exceptions I have found the pilots lack courtesy. They demand many things without even asking where they are or if this is a public airport, and even if this was a public port I do not think that their attitude would make them popular. I know of one very famous aviator who had a forced landing close to us, the farmers and others assisted him in moving the plane and starting the motor and offered to assist in any way without knowing who he was, but he cranked up and left without even a "thank you" for their efforts or offers. I can understand why they feel "peeved" towards all strange pilots now. I have on numerous occasions driven to the port hearing a plane pass over the city, pumped gas for them, helped them unload and brought them to the city, all of which they seem to take as a matter of course and many of them do not seem to appreciate our efforts.

The average pilot may not realize that people assisting him on forced landings, landing on private fields, etc., are entitled to consideration, and the lack of it may mean that the next unfortunate fellow may not be received as he was.

[Name withheld by request]

Editorial Comment FROM THE DAILY PRESS

Highways of the Air

Aviation development in the United States has been largely a Federal, municipal and commercial advancement with the states and the counties not participating.

The day is at hand when this will no longer be the case because states and counties must of necessity play their part in the expansion of the new industry.

In 1926, 5,800 passengers were carrier in airplanes in this country. In 1928 the figures rose to 49,700 and this year will likely see the 100,000 mark passed. However, with only Federal assistance the industry can go only so far and that period will soon arrive. Unless the states and counties take a hand there will be a marked slowing up in development so far as private flying, particularly, is concerned.

The automobile never became a real factor in long-distance travel until the states and the Federal Government joined in creating Federal-aid highways. The cost of these highways has been roughly $25,000 a mile, a figure which swells largely when maintenance cost is added. The development came in order that private individuals might travel far and wide in their automobiles.

Federal-aid highways of the air are now being advocated in the aviation industry and it is not surprising because long distance flying can only be accomplished over marked routes with ample landing facilities, night-lighting of airports, radio beacons and other safety devices.

The growth of the air-mail, which up to a few years ago marked the only aeronautical progress in this country outside of the Army and Navy, has brought about 15,000 miles of lighted and improved airways, mostly paid for by the Federal Government. An appropriation of $5,408,000 was provided the last fiscal year and this will probably be increased to nearly $8,000,000 for the pending year.

As in highway development the Federal Government will only establish transcontinental routes in the paths of the air-mail planes. Lateral routes must be supplied by the states and that is where the state and county governments must figure.

So far only four states have seen the necessity of aerial highway development—Idaho, Virginia, Pennsylvania and New York. Others will be forced into it and must begin to give serious thought to the subject.

Municipalities are doing their part by creating airports, but it is noticeable that communities in certain states are more progressive along that line than in others.

Figures worked out on highways of the air show a cost of $2,300 a mile, including lighting at $732. Maintenance will be around $320 it is estimated. Much cheaper than $25,000 a mile for highways.

The states can either act in advance of pressure from their citizens or await the time they will be forced to do so. Just how progressive or backward they may be will be judged at a not too distant date by the course that they take.

—Washington News.

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The Menace to Large Cities

An airplane, flying above Manhattan, develops motor trouble. The passenger makes a parachute jump and saves his life. The amateur pilot is killed when his ship rams the side of a building.

A plane circling above Seattle begins to misbehave. The pilot is forced to land on the flat roof of a department store in the most crowded section of the city. He and his passengers escape with their lives, but he barely misses sliding over the edge into the street below.

What is the flier's duty in regard to crowded cities where chances for landing safely are meager and highly uncertain?

Accidents of the sort recorded in the current news have been infrequent since aviation started to skyrocket in this country. But two of them have happened within a week. In each case street crowds were imperiled.

Now, before fatalities are multiplied, is the time to develop and enforce a safety code for flying over populous centers. It is certain that this sort of aviation should be sharply restricted. It is definitely known that the air over large cities is "bumpy" and dangerous.

New York has organized a sky police force. A sky police force may be of use, but after a motor has begun to miss a police plane nearby is of no more value than a foot policeman a mile below.

One definitely valid suggestion, at least, is contained in the comment of Roosevelt Field officials on the New York mishap. One remarked:

> If there is any lesson to be learned from this accident it is that none but the most experienced pilots should be permitted to fly over a city like New York. I would favor limiting flight over cities to commercial pilots qualified by long experience to meet any emergency.

Cities now do have restrictions as to the altitude which planes must maintain when flying above them. To these should be added requirements as to the type of planes and the class of pilots permitted to operate over such areas, and as to reasons justifying such flights.—Philadelphia Record.

New Volumes FOR THE SHELVES

Aircraft Handbook

The Aircraft Handbook. *By Fred H. Colvin and Henry F. Colvin. McGraw-Hill Book Company, Inc., New York, 1929, $5.00, 690 pages.*

In the current edition of this handbook, which first made its appearance in 1918, the authors have made a most successful effort at modernization in presentation and in bringing their information up to date in such a rapidly progressing industry. For the embryo in aviation, or even the man experienced and expert in only one phase of aeronautical activity, the book contains a wealth of information that is extremely useful in rounding out aircraft knowledge.

By the very scope of the book which includes among others such widely divergent section headings as "Rigging and Servicing the Plane," "Trouble Shooting for Airplane En-

gines Materials for Aircraft Construction S A E Standards Airships Construction of Airports, Air Commerce Regulations etc." the authors have inadvertently disclosed that the aeronautical industry has grown to such proportions that it is rather difficult to serve all its branches with a single handbook that will bear the stamp of recognized authority in all its sub-divisions It would appear that future editions, in order to avoid absolutely unwieldy proportions, were better confined to the activities of primary interest to the operator and mechanic, leaving the manufacturer and designer free to obtain their information from other sources, or from a handbook dedicated primarily to their own uses

For the "practical" man, or the young man entering or contemplating entering aviation in any of its specialized branches, the book is ideal It provides a wealth of practical information, presented in a way that makes it directly applicable to his points of contact with the industry More than that it takes him out of the path of romance and glory in aviation achievement, and sets him out on the road where knowledge is power, and facts must first be mastered It is a book which were well placed in the hands of every young man launching an aeronautical career, for it is well for every such to have a readily comprehensible vista of the industry as a whole available before he strives too haphazardly along one line, awaiting "his chance."

In its value to the airplane manufacturer and designer, the book suffers somewhat from the tendency to quote specially prepared data from interested sources This is particularly noticeable in the section on Materials of Construction where Balsa wood is discussed at great length and spruce ignored, tinned aircraft wire and non-flexible cable still exclude streamline and internal tie rods from detailed consideration, and a few detailed bulb angle sections are presented without further reference to the large group of duralumin extruded shapes available for aircraft applications There is a tendency for the interested advocates of a specially used material, part or process to quote its detail applications at great length, while the far more generally used article in the same field is taken for granted by its proponents in this regard a condition which must be recognized by the authors of books such as this, lest they unconsciously place their emphasis on the wrong articles, to the confusion of their readers

For the airport mechanic, whose number is constantly being added to by the expansion of aircraft transportation, the book is a decided asset True, many of the details considered may be things he has already mastered in a practical way, but it is safe to say that even in such instances it discloses the "whyfore" for things he may have been doing only by rule of thumb, and occasionally incorrectly

The book, considering the broadness of the range covered and the inherent difficulties of covering an industry in all its ramifications and from every angle in a single volume is remarkably well done and a credit to the discernment of the authors in selecting the things of major significance to the greatest number

—John F Hardecker

Abstracts AND *Reviews*

New England Weather Service

Developing a New Weather Service for New England's Aviators *by Carl Gustaf Rossby published in two parts by The Boston Evening Transcript, Oct 28 and Nov 4, 1929.*

Weather reporting service which would provide complete and frequent information about flying conditions all over New England could be maintained at a cost of $100,000 per year, according to the careful plans and estimates prepared by Mr. Rossby While these plans are frankly based to a large extent on the results obtained by the service established with the aid of the Guggenheim Fund in southern California, developments in Europe, by the U S Weather Bureau and other agencies have also been given due consideration The author makes special acknowledgement of assistance given by Professor Sayre of the Massachusetts Institute of Technology in the application of his ideas to aeronautic needs

The essential basis of the plan is a series of leased telephone wires operating with teletype systems, which would connect Boston (the central point) with Newark N J, New Haven and Hartford, Conn, Pittsfield, Springfield and Worcester, Mass, with Manchester, N H, and Portland, Me, with Providence and Newport, R. I Each of these points would collect weather information by long distance telephone from adjacent points at fixed hours during the day probably 6, 8 and 11 a.m, 2 and 5 p m Weather charts for the whole of New England would thus be prepared at each central station five times a day In addition, reports of sudden changes or traveling storms could be made at any time and wireless service would be provided for planes in flight

Standard instruments for recording temperature, pressure humidity and wind velocity should be provided at each of the eleven central stations In addition they would have a supply of small balloons hydrogen, and a theodolite for measuring the position of the balloons when released, indicating wind velocities at different altitudes The balloons also serve to indicate the height of ceiling in the daytime at night a standard ceiling light is used For the substations the author believes that sufficient equipment would be dry and wet bulb thermometers aneroid barometer, wind vane and three-cup anemometer The observers should, of course be trained so that they could give accurate descriptions of clouds, general weather and visibility

It is expected that this initial equipment could be purchased for about $50 000, and that the cost would be borne by the thirty communities where stations would be established The estimate for yearly upkeep cost is based on allowances of $20 000 for telephone printer lines, $5 000 for rent of printer instruments $20 000 for long distance toll calls, and the rest for salaries for observers, varying between $25-$50 per month at the substations to more substantial salaries for trained personnel at the central points This maintenance cost would presumably be borne by the various states, divided according to the number of stations in each.

In addition to the obvious benefits which this service would give for transport and private flying, the author remarks that such a complete weather reporting system would also be of great benefit both to farmers and to cities and towns as they might be affected by storms. In the case of snowstorms for example, it would save much time and money if cities could know in advance exactly when to expect them, so that preparations for clearing streets, etc could be made definite, instead of by guesswork as is the case at present.

An interesting suggestion, particularly for New England where conditions for flying are frequently poor, is the possibility of establishing several alternative airways between given points With the benefit of exact knowledge of the weather at different points it would then frequently be possible to maintain schedules when regular routes were unavailable for flying

Mr Rossby also points out that a pilot would not hesitate to take off in a fog if he could be sure of finding clear weather a few miles farther on whereas at present under such conditions the flight would probably be abandoned

Professor Rossby has had extensive experience in meteorological work, having studied at the Geophysical Institute in Bergen, Norway, and at Leipzig, Germany He did research work for the U S Weather Bureau, and aided in the establishment of the model weather reporting service in California Since last year, he has been head of a special course in meteorology at the Massachusetts Institute of Technology. The study summarized in the articles in the *Boston Transcript* therefore may be accepted as representing the best meteorological information at present available

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Chrome Steel Welding

Welding Rustproof Steels, *By W. Hoffman, from Autogene Metallbearbeitung, N.A.C.A. Technical Memorandum No 531*

Mr Hoffman presents the results of tests made in Germany on the methods of welding high-percentage chrome and chrome nickel steels

Experiments were made with both oxyacetylene and electric arc welds Welding with the gas was found to require the same precautions as in the welding of ordinary steels The resulting weld was not as deep as with ordinary steels

It was found that using an electric arc the welding rods melted very rapidly resulting in a shallow weld This could be avoided by covering the rods with a protecting substance that melted easily and spread over the surface rapidly

The greatest difficulties in welding rustproof chrome steels arise from the hardening during the welding It was found that the hardening in the arc welds was not so extensive as in the gas welds, but in both cases, the hardness could be removed by suitable thermal treatment

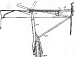
Tests showed that the physical properties of welds in rustproof steels were better than those of soft-steel welds and that their resistivity to corrosion was better than that of the welded material before welding

New Patents

Retractible Landing Gear

1,737,536 AIRPLANE George M Lewis Detroit Mich Filed July 13 1929 Serial No 377,981 7 Claims (Cl 244—2)

Retractible landing gear for combined land and water airplanes The airplane wing at each side is provided with a recess on its under surface in which the wheel at that side is intended to be housed For the purpose of swinging the wheels into and out of the housings the pilot operates a chain drive to a threaded shaft on which travels a nut This nut is pivoted to one end of a leg which carries the wheel to its other end. A link is pivoted at one end to the leg near the wheel and to the wing at its other end



The illustration shows wing 11 shaft 15 nut 20, leg 25, link 27 wheel 25 and socket 45

This design is intended to permit the wheels to be retracted or other end This design is intended to permit the wheels to be retracted or extended as the shaft is rotated to cause the nut to approach or move away from the connection of the link to the wing A socket, intended to take up the shock caused by alighting on water, receives the nut when the wheel is in retracted position

• • •

Auxiliary Wing

1,738,462 WING-STRUCTURE-VARYING DEVICE FOR AEROPLANES. Aldo Tammeo, Genoa, Italy assignor of one-half to Eugenio Cominada Genoa, Italy Filed July 25 1928 Serial No 295,148 and in Italy July 29 1927 8 Claims. (Cl 244—12)

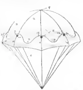
An auxiliary wing at each side of the fuselage is embedded in the under side and forms part of the main wing The object of this construction is to permit the auxiliary wing to be lowered when desired so that greater lifting surface may be obtained, and to be placed within the contour of the main wing when less lifting surface is desired For this purpose a pair of worm gears operating in sleeves fixed to the auxiliary wing is provided at each side so that a pilot may raise or lower the auxiliary wings by rotating the gears An additional worm gear engages each auxiliary wing near the rear end so that its angle of incidence may be varied

• • •

Parachute

1,737,913. PARACHUTE Charles Broadwick San Francisco Calif Filed Nov 5 1928 Serial No. 317,143 6 Claims (Cl 244—21)

A parachute is provided with a skirt portion to increase the air-resisting power The skirt portion is scalloped at its upper edge and is connected to the parachute along this edge, with the higher portions of the scallops registering with the seams of the parachute Large and small pockets are thus formed in the skirt, the air being directed from the small pockets into the large pockets Each of the large pockets and the parachute are provided at the top with a vent opening formed by a rubber-band The bands contract the openings but when the pressure of air becomes excessive they are designed to open in proportion to the pressure to permit the air to rush through and thereby prevent tearing of the fabric Supporting lines are connected both to the parachute proper and to the skirt.



The illustration shows parachute 2 skirt 11, scallops 12 13 large pockets 14, vents 9 15, and supporting lines 4.

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Landing and Launching Device

1,738,261 AEROPLANE-HANDLING STRUCTURE Willis J Perkins, Grand Rapids Mich assignor to Willis B Perkins and Burgess M Kidder Grand Rapids Mich Filed July 24, 1922 Serial No 576,553 62 Claims. (Cl 244—2)

Means for landing and launching from ships Towers are erected one at each side of the ship, and spaced lengthwise so that a cable may be suspended between them A trapeze is suspended from the cable by a roller carriage and an airplane is provided with a hook for engaging the trapeze in flight The airplane and trapeze are intended to roll to the central lowermost point of the cable by reason of the roller carriage support The cable may then be unwound from a sheave by a motor to permit the aircraft to be landed on deck or stored in a hatch which is provided for the purpose The hook on the airplane is designed to be raised when it is desired to land on the trapeze and to be lowered within the fuselage at other times by operating a handle in the cock pit A launching mechanism is also provided and includes a motor for winding up the launching cable and a latch engaging the airplane until it is desired to launch the same at which time it is designed to be released by operating a release pin to free the latch

SIDE SLIPS

By Robert R. Osborn

The Intrepid Aviator stopped by the desk just now for his weekly supply of cigars and in the course of his usual sales talk showed us a clipping from a local paper concerning the proposed flight of the Graf Zeppelin to the North Pole next spring.

"Under command of Captain E A Lehmann, the Graf Zeppelin with the twelve scientists, will carry fresh provisions for five days,—the longest period it is expected to remain away from its bases at Tromsoe, Norway, and Fairbanks, Alaska Emergency provisions for ninety days will be carried and full equipment for travelling on foot on the ice. Twenty three eskimo dogs will go along"

The Intrepid Aviator says that before he went on that expedition he would want a clear understanding whether eskimo dogs were classed as fresh provisions or emergency provisions

• • •

Mr R A. C. of Lyndhurst, N J, sends in some clippings about the department store Santa Claus in Wilkes Barre, Penna, who jumped with a parachute from a airplane over the city He intended to land in a city park where thousands of children were waiting for him, but missed badly and fell into the Susquehanna River, from which he was rescued by a policeman

It had always been our complaint when we were much younger that Santa Claus was very inaccurate in his handling of his back-pack, and now it seems he is just as inaccurate in his work with the seat pack

• • •

Lieut. N A G of the Palo Alto School of Aviation Palo Alto, Cal sends in the following copy of a letter of inquiry received by his school

"Dear Sir —May I ask you whether your school will permit a man who wish to complete his Primary course, by doing some shorts work for your school, of course for some others course like flying which I am willing to pay which can not be rely upon you, which is very expenses. Trusting you will consider my application as to enrollments, Very trult, "

In our opinion clearly a case of some one who has become too "air minded."

• • •

Our Hangar Flying Department

Mr H L C of Garden City, N. Y, wandered into the office the other day with a good story about an absent-minded pilot, which story was told to him by F K of St Louis The absent-minded subject of this story is a Navy pilot but at the time of this incident had been putting in practically all of his time in land planes He was transferred to the San Diego station and was again assigned to landplanes for some time Then he was given a Martin T-4M seaplane one day and after about an hour's flight started to set the ship down on the land field His co-pilot took the ship away from him, gunned it off and made a landing out in the water The absent-minded one was extremely apologetic, explaining that he had had so much time in landplanes that he was always forgetting himself when he got into a seaplane Then he climbed over the side and dropped overboard

• • •

An Oakland California man is suing for divorce on the grounds that his wife is "sullen, mean, irritable, morbid, disagreeable, nasty, gruesome cool, bitter, jealous, heckling, picayunish loathsome, insulting, brazen, miserly, gluttonish, temperamental selfish, contemptuous, inattentive, uncivil and inconsiderate"

This genius of the vocabulary must have been the author of most of the scenic descriptions along some new air lines, and sales prospectuses of some new airplanes, we have read recently.

• • •

We are very much pleased with the progress made by the Society for the Aeronautical Education of Newspaper Correspondents and Artists This society, of which we are still the president and only member, was started on its educational campaign by the fearful and wonderful portrayals of airplanes which made their appearances in the news columns and magazines after Commander Byrd's North Pole flight. Then he and Bennett were pictured flying to the Pole in everything between a twin engined Jenny with one cockpit just forward of the tail to a Sea Gull flying boat fitted with ironing board skis

The various news accounts were equally bad, reporting the Commander rambling along the outside of the ship to the tail to make sextant observations, and Bennett top-overhauling an outboard motor which had developed serious oil leaks In the interests of the younger generation, which might grow up thinking that airplanes really look like those pictures, we took up the fight and devoted this valuable space for lo, these many years, in the aeronautical education of newspaper reporters and artists The work has been hard and discouraging Many times just as we thought some progress was being made, some paper would print a picture of a ship spinning tail down, or a cigarette advertisement would show the gas hose man, of a ship being refueled, standing nonchalantly on the top wing of his ship

Now the Commander had flown to another Pole, and with great fear and trembling we watched the papers The results were absolutely astounding The only serious social error which we have found so far was called to our attention by E A H, in the San Angelo, Texas, *Evening Standard*, which shows a picture of a Fokker Universal as the "huge tri-motored plane" to be used in the flight. Another disappointing feature of the flight really can't be blamed on anyone but it is disappointing, nevertheless. On his North Pole flight Byrd saw "no life nor seals" according to the esteemed New York *Times* We have read many of the reports of this flight appearing in the *Times* but none of them clear up the life and seal situation at the South Pole All of these years we have been waiting with great anxiety for this information, and the *Times* chooses to overlook that point

Well, one can't accomplish everything in one lifetime, and in general we consider that the work for which the society was organized has been satisfactorily accomplished As soon as we can dispose of the office equipment, a large waste basket, the society will cease to function. Anyone wishing to contribute to the fund, however may make out personal checks to the editor of this space and the money will be put to good use immediately

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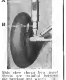
AND

PERFORMANCE

The conditions under which Aerol Struts are manufactured make for proven Quality and Performance. The steel going into them is rigidly tested in our modern metallurgical laboratory. Electrically controlled heat treating eliminates the chance of human error. Machined with exacting tolerances and assembled by men who have a tradition of 25 years of building fine products, it is inevitable that every Aerol Strut maintain the highest standard of quality.

In addition to this rigid production control, Aerol Struts are subjected to thorough test in actual operation on our own ships. We have always maintained this policy, believing that no aircraft product can be considered efficient until it has proven itself in the air.

Aerol Struts are manufactured at Cleveland by The Cleveland Pneumatic Tool Company. There is a type and size for every airplane.



This view shows how Aerol Struts are installed between the fuselage and wheels. A is the stationary cylinder. B is the sliding piston attached to the axle allowing perfect freedom of movement, yet effectively eliminating destructive shock before it reaches the fuselage

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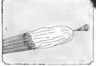
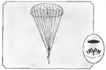
The PILOT CHUTE *Assures Happy Landings*



As soon as the pack opens, the pilot pulls out the parachute

Once the parachute fills, the pilot chute has done its work



And you glide gently to earth for a Happy Landing!

THE pilot chute of an Irvin snaps the parachute out of its pack in record time because this miniature chute is ribbed with spring steel and packed under tension. You jerk the pull ring . . . it springs out quickly . . . the big chute fills with air, and you are in flight . . . gliding gently to earth.

The Irvin Air Chute is available in seat, lap or back pack types. All Irvins are identical in construction and are made in two grades of fine silk, one priced at $350, the other at $290. Every one, regardless of price, complies with the standard U. S. Government parachute drawings.

Irvin Air Chutes are available in all sections of the country.

Among the important distributors are Curtiss Flying Service, Inc., The National Flying Schools, Air Associates, Inc., and Nicholas-Beazley Airplane Co.

Dealers who are interested should communicate directly with the company. If there are no dealers near you, write to us and we will arrange the most convenient way to supply your needs.

IRVIN *The Life Preserver of the AIR*

IRVINC AIR CHUTE CO., INC., 372 PEARL STREET, BUFFALO, N. Y.

Our Motion Picture "Happy Landings" on standard width film, illustrating actual operation of the Irvin Air Chute is available free of charge to schools, clubs and organizations interested in aviation. Send for booklet and particulars.

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Nothing is apt to cost so much as a bearing that cost so little

SKF Puts the Right Bearing in the Right Place

"In Building these huge Planes Boeing spared no expense... Quality First"... and used SKF

"IN the building of these great transports no expense was spared, and the first requirement of the Boeing Company in purchasing material was...quality. These ships, representing an investment of approximately $70,000 each and entrusted with the safe transportation of passengers and valuable mail... are equipped with SKF Anti-Friction Bearings." That is the story, as told by Boeing Air Transport, Inc., of the part SKF products play in the successful operation of their transcontinental air liners. It speaks for itself.

Twenty hours from the Pacific Coast to the Great Lakes! That is the time these tri-motored giants of the air make, carrying 18 passengers. Each plane has a wing span of 80 feet, length over all of 55 feet, and weighs 8¾ tons when fully loaded. Flying with the largest loads carried anywhere in the United States commercially, over the greatest range in altitude from sea level to 12,000 feet, and temperatures from 20 below zero to 135 degrees above, there could be no compromise with safety and dependability. And SKF are making good... to the tune of 10,000 miles of flying every day on the Boeing system.

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This Battery is built for hard Flying Service

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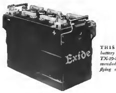
Exide Aircraft Battery *is specially designed to meet all flying needs in any type of aircraft*



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Millions of miles of hard flying service stand witness to the rugged qualities of these batteries. Specially designed by skilled engineers, they are planned to meet all the rigid requirements set for air equipment.

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Titanine-finished airplane surfaces are safeguarded against this injurious spray. Even when the evaporated spray turns into grinding salt crystals, Titanine-doped surfaces present no minute cracks for the particles to enter and break down the fabric with their corroding action.

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HIGHEST QUALITY 100% SUPREME PENNSYLVANIA OIL

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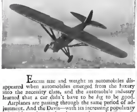

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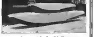

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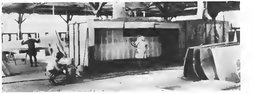

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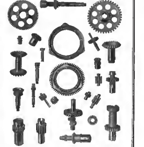

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LIMITED commercial pilot. Parks Air College graduate desires position with firm or individual, one year college education, best references, will go anywhere. PW-371 Aviation, 520 N. Michigan Ave., Chicago, Ill.

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Kittyhawk Model B-4

Engine — Kinner K-5	100 H.P.	Weight empty	1107 lbs.
Approved Type Certificate No. 166		Useful load	768 lbs.
Length overall	22 ft. 11 in	High speed	110 m. p. h
Height overall	8 ft. 8 in	Cruising speed	90 m. p. h
Span both wings	28 ft.	Landing speed	38 m. p. h
Chord both wings	4 ft. 8 in	Climb	1200 ft. p. m
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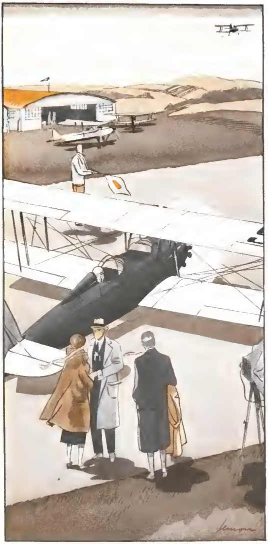

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